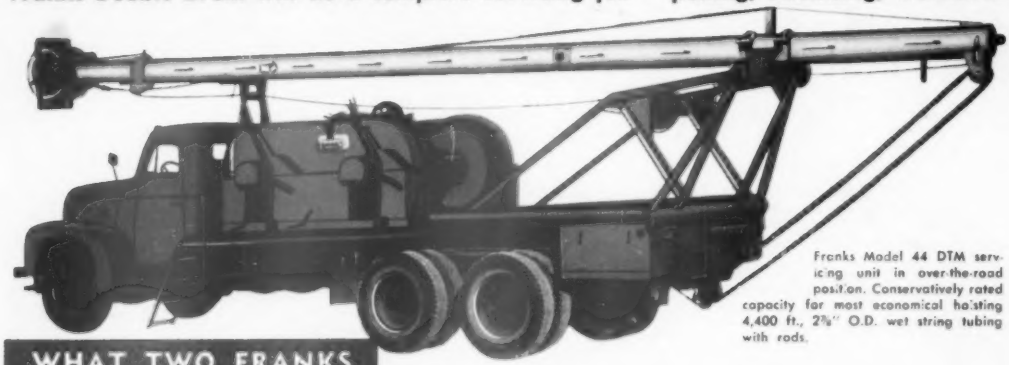
MIDYEAR REPORT

the OIL AND GAS JOURNAL

YOU DON'T GAMBLE when you buy FRANKS
THE LEADER OF SERVICING UNITS

Franks Double Drum will do a *complete* servicing job — pulling, swabbing, workover



Franks Model 44 DTM servicing unit in over-the-road position. Conservatively rated capacity for most economical hoisting 4,400 ft., 2⅜" O.D. wet string tubing with rods.

WHAT TWO FRANKS RIG OWNERS SAY...

"All of my Franks Units are in demand by major producer customers."—**K. D. Emrick, K. D. Emrick Well Servicing, Seminole, Okla.**

"Seven months ago I purchased my first Franks unit. I have been pleased with its performance and regret that I did not buy Franks sooner"—**Chester Taggart, Taggart Well Servicing Co., Grandfalls, Tex.**

Franks servicing units are the leaders *because*: they are field proven with all but one or two of the units built since 1931 still in use; *because* companies request contractors use Franks units on their jobs; *because* contractors find Franks are money makers; *because* they do work faster and with less time out for maintenance.

Franks servicing units are now "packaged" to fit any standard truck of adequate capacity and can be installed in 12 to 36 hours. A few of Franks features: Franks famous hoist embodying the smoothest high capacity clutch yet developed; hydraulically adjusted and equalized brakes; Franks famous power-take-off. See a Franks representative for full details including many more features we haven't space to describe here. Or write for further information.

FRANKS MANUFACTURING CORP.
Box 3218 Tulsa, Oklahoma

Canadian Representative: Oil Equipment Ltd., Calgary and Edmonton

Export Representative: A. V. Simonson, 149 Broadway, New York, N. Y.

Available through your favorite supply store.

FRANKS 24-HOUR "On the Spot" FIELD SERVICE

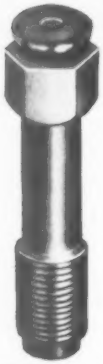
available at Alice, Casper, Compton, Great Bend, Houston, Kilgore, Odessa, Seminole, and Tulsa with stocks of parts and factory trained personnel.

FRANKS MFG. CORP.
WELL SERVICING AND DRILLING UNITS
TULSA, OKLAHOMA

Announcing

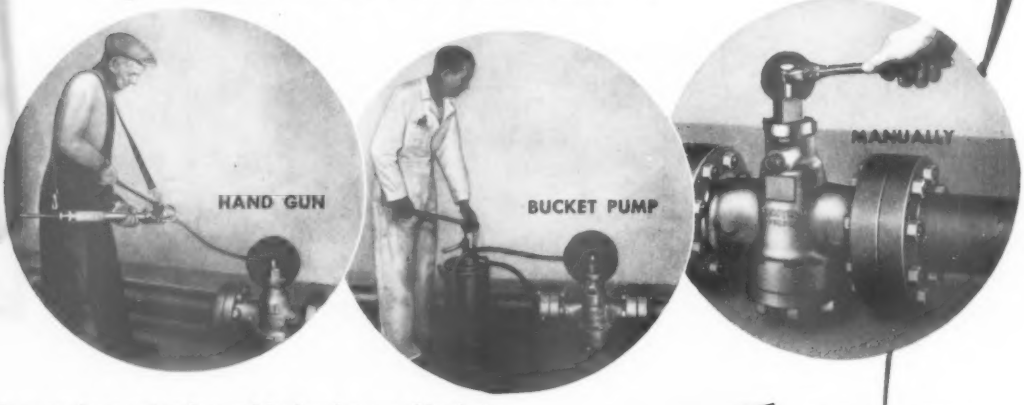
The NEW ROCKWELL FITTING

For Nordstrom Hypreseal Valves



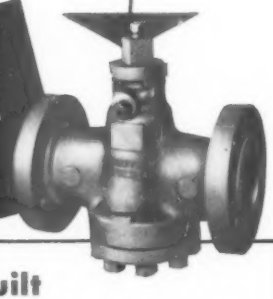
A COMBINATION LUBRICANT SCREW AND GIANT BUTTON HEAD FITTING

NOW Nordstrom Hypreseal Valves Can Be Lubricated *WITHOUT INTERCHANGING PARTS* By These Three Methods . . .



To meet the growing demand for hand gun and bucket pump lubricating equipment, Rockwell Manufacturing Company has developed a new fitting for Nordstrom Hypreseal valves which is adaptable to any method of lubrication. Now furnished at no additional charge with all Nordstrom Hypreseal valves, the new fitting eliminates the bother and cost of purchasing giant button head fittings for hand gun or bucket pump lubrication. The new Rockwell fitting is also available as a separate unit to replace the lubricant screw on Nordstrom Hypreseal valves now in service. For further information contact your Nordstrom representative or write to Rockwell Manufacturing Company, 400 North Lexington Ave., Pittsburgh 8, Pa.

Now Standard Equipment on all Nordstrom Hypreseal Valves



ROCKWELL Built Nordstrom Valves

Another Rockwell Product

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

THE OIL AND GAS
JOURNAL
Vol. 51, No. 12

CONTENTS FOR JULY 28, 1952

NEXT WEEK

- Benton Water Flood Recovers 2 Million Barrels of Oil in 25 Months.
- How to Design and Operate Refinery Flares.
- Oversize Drill Collars for Crooked-Hole Country.
- Location of Deep-Seated Salt Domes by Aerial Photos.
- How Southern Minerals Stores Excess L.P.G. Production.
- How to Increase the Height of a Distillation Tower.
- Other Articles and Regular Features.

REGULAR DEPARTMENTS

They Say	177
Calendar of Events	180
Journally Speaking	185
Editorial	187
This Week	189
Watching Washington	196
International News	201
Personals	204
Deaths in the Industry	206
Books	368
On the Job	370
Questions on Technology	375
Engineering Fundamentals	379
Natural-Gas News	387
Natural-Gasoline News	389
Pipe-Line News	390
Refining News	395
Drilling Contractors	398
Active Rotary Rigs	400
Exploration Statistics	424
Production Statistics	425
Refining Statistics	426
Market Statistics	427
Equipment Men in News	429
Classified Advertising	431
Advertisers' Index	435

EXPLORATION—DEVELOPMENT

First-Half Exploration	403
Highlights of Week	403
Reports by Areas	404
Summary of June Completions	428

NEWS FEATURES

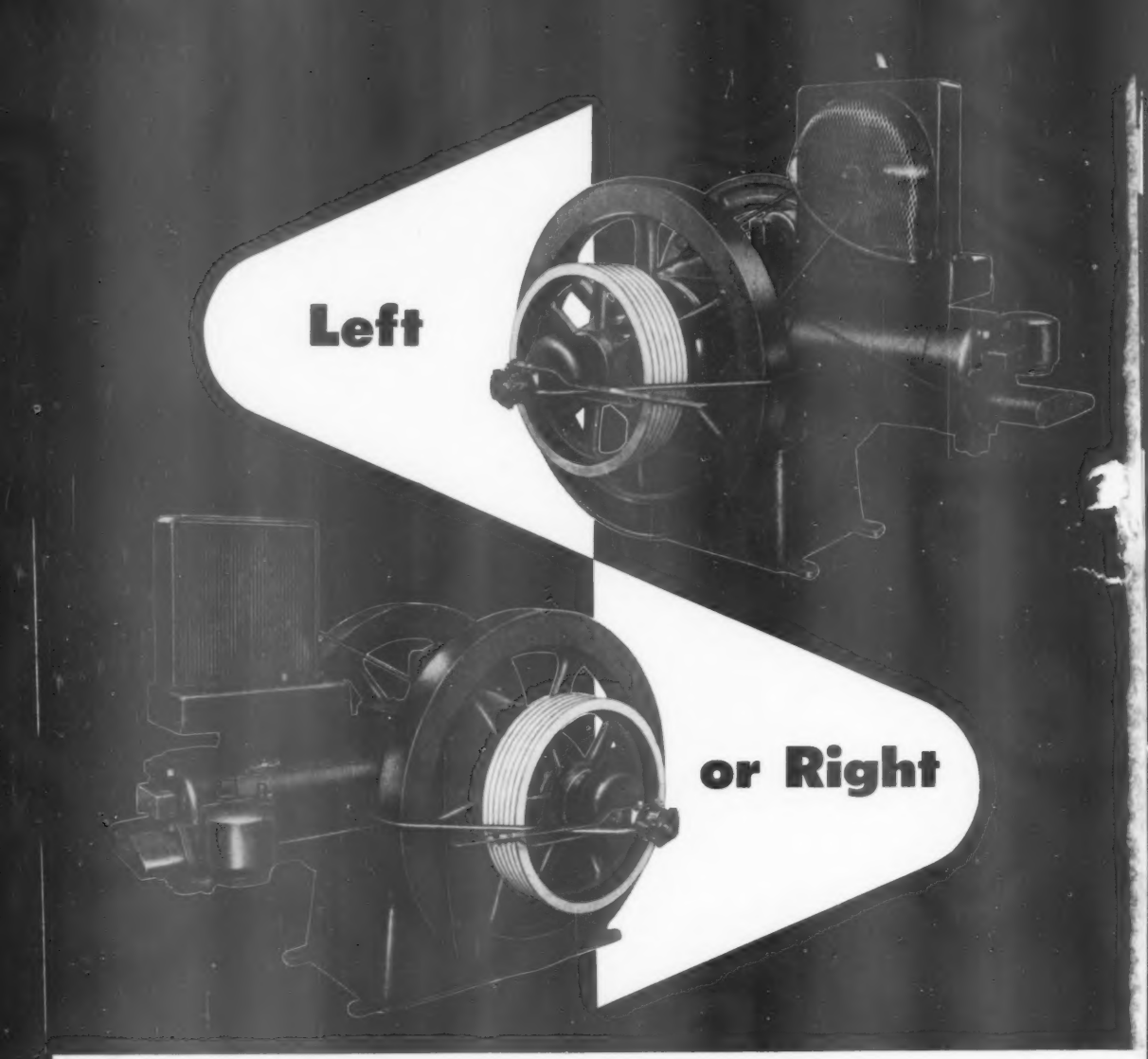
Trans Mountain's Big Crude Project Picking Up Steam	190
Williston Basin Geophysical Activity Runs at $2,000,000 Monthly	191
California Industry Recovering From Strongest Quake in 40 Years	192
General Gas Corp. Ends First Year of L.P.G.-Storage Operation	193
Refiners Pledge High Runs to Meet East's Fuel-Oil Needs	193
Old Oil-Cartel Charges Again Stirred Up in Congress	194
DPA Approves $92,500,000 in New Oil Facilities for Tax Aid	194
Dedication of Wilshire-McElroy Plant Opens New Conservation Era	197
Du Pont Survey Shows Octane Climb for Both Premium and Regular	198
Petroleum-Derived Sulfur Plays Big Part in Whipping Shortage	199
John W. Brice Replaces O. C. Schorp as President of Carter Oil	199
U. S. Oil Strike Plummets World Crude Production in May	201
World Court Says It Has No Jurisdiction in Iranian Oil Dispute	202
Attempt to Replace Mossadegh in Iran Starts Near Revolution	203

MIDYEAR REPORT

Record Drilling Year Seen Despite Shortages	208
First-Half Completions Establish New Record	210
Steel Strike Results in Stacked Rigs	213
Strikes Hold Production to Modest Gain	214
First-Half Petroleum Demands Below Those Expected	216
Refinery Runs at Near Capacity for Last Half	220
Light Hydrocarbons Set New Record	221
Imports and Exports Up First Half	222
Foreign Production Rise Slowed Slightly	225
Natural-Gas Industry Still Expanding	228
Pipe Lines Expanding Rapidly	233
Refining Capacity Nears 7.5 Million Barrels	244
Twenty-four Field Processing Plants Building, Planned	252

ENGINEERING-OPERATING FEATURES

What is the Future of Petroleum Discovery?	258
L.P.G. Goes Underground for the Summer	260
Drilling and Completion Methods, Shallow Wells	262
Solidification of Lime-Treated Muds	265
New-Type Distillation and Absorption Column	268
Effect of Hydrodynamic Forces on Pipe-Line Crossings	272
Orifice Coefficients for Large-Diameter Lines	288
Electronic Control at Llandarcy Refinery	304
Producing and Gathering Low-Pressure Gas	322
New Light on the Use of Graphic Panels	334
New Ideas on the Classification of Oil and Gas Wells	355
On the Job . . . Pump Maintenance	370
Questions on Technology	375
Engineering Fundamentals	379
How Service Pipe Line Co. Keeps 'em Pumping	386



is right with the "ZC"

With a Fairbanks-Morse "ZC" Engine on your pumping rig, you can mount your clutch and sheave on either the *right* or *left* side of the engine. It's a big convenience feature that makes it easy for you to mount the engine where you want it on your pumping jack.

The TWO big flywheels of the "ZC" make this feature possible and give you the important flywheel effect on each side of the engine for smooth operation and economical performance.

The Fairbanks-Morse Type "J" clutch and sheave assembly are ruggedly built units with extra heavy friction plates and contact parts to prevent distortion and assure uniform pressure at all times.

For the complete story on the "ZC" . . . *the engine with the big double wheels,* see your local supply store or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE,
a name worth remembering

OIL FIELD EQUIPMENT • PUMPS • SCALES • ELECTRIC MOTORS • GENERATORS • LIGHT PLANTS • DIESEL, DUAL FUEL AND GASOLINE ENGINES • MAGNETOS • DIESEL LOCOMOTIVES

Proved by users from coast to coast . . .

MACWHYTE WIRE ROPE

A THOUSAND AND ONE

different ropes
Designed right—made right
PREformed and
internally lubricated

MACWHYTE COMPANY
KENOSHA, WIS.

EVERY REEL of Macwhyte Wire Rope reflects a pooling of users' experience. Over the years this experience has been studied in the field by Macwhyte engineers. Your requirements dictate the design and making of Macwhyte Wire Rope for all equipment.

Recommendations for your particular needs are promptly available either from Macwhyte Distributors or Macwhyte Company.

ASK FOR CATALOG G-15

MACWHYTE COMPANY, 2916 Fourteenth Avenue, Kenosha, Wis. Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope and Wire Rope Assemblies. Mill depots: New York • Pittsburgh • Chicago • Minneapolis • Fort Worth • Portland • Seattle • San Francisco • Los Angeles • Distributors throughout U.S.A.

Tomorrow's Tools - Today!

ALL PUT TOGETHER...

depth measurement ACCURACY
EXPERIENCE gained in over 170,000 jobs
Extra Deep PENETRATION
utmost SAFETY for well and crews
Quick SERVICE from 69 locations

they make KONESHOT

the "plus-value" shaped-charge perforating

that's why operators get better completions with

LANE WELLS

KONESHOT

AK-506

General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58

LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

LINK-BELT

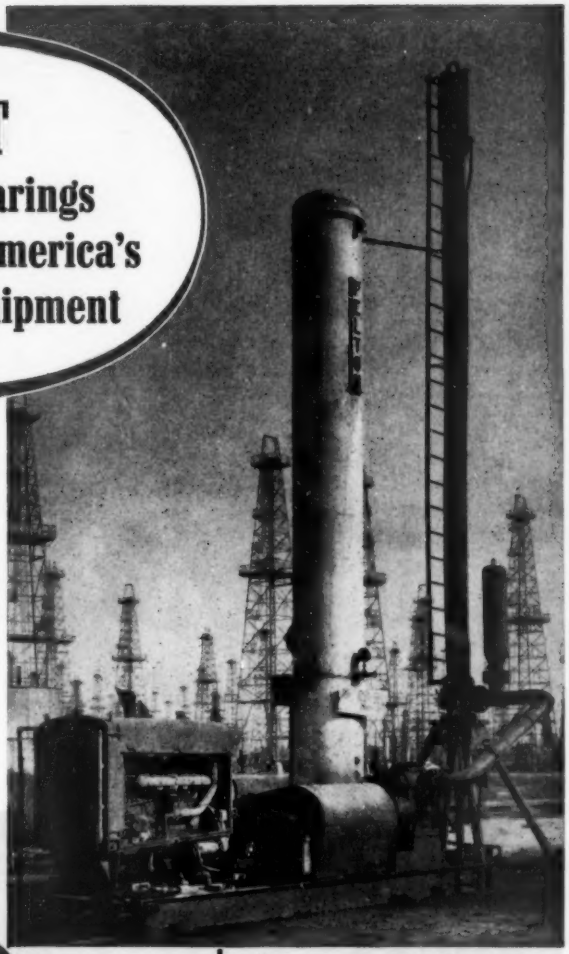
Ball and Roller Bearings keep company with America's hardest working equipment

WHETHER it's a pumping unit or a drilling rig . . . compound or spudder—top oil field designers know they can rely on Link-Belt's complete line of mounted ball and roller bearings.

They've learned that mounting vital rotating parts on precision Link-Belt bearings assures longer machine life . . . greater freedom from wear, excessive lubrication and maintenance expense.

There are sound reasons for this universal acceptance. Foremost is *quality*. At Link-Belt, quality is no idle catchword. It's *real*—the result of continuing research . . . sound engineering . . . highest grade materials . . . skilled craftsmanship . . . rigid inspection.

Let a Link-Belt bearing specialist show you how this unvarying quality can step up your production efficiency and economy. Or you can get complete engineering information from Data Book 2550.



▲ Pelton Pumping Jack operates day in, day out—rain or shine. Rugged Link-Belt series 6800 and 6900 Roller Bearing Pillow Blocks are used exclusively.

CUTAWAY OF SERIES 400 ROLLER BEARING PILLOW BLOCK

Lubrication fitting with pressure relief feature prevents excessive grease pressure.
The "housing sealed" feature fully protects and lubricates all moving surfaces
Threaded end cover with two set-screws and fibre locking inserts holds bearing firmly in housing.
Self aligning — inner raceway is truly spherical, free to move in any direction without altering contact area with rollers. Full load capacity always assured even with shaft deflection or misalignment
Long inner ring distributes bearing load over large shaft area.
Large grease reservoir prolongs lubrication inter vals
Easily installed by slipping bearing onto shaft and clamping inner ring by tightening two set-screws in spring-locking collar.
Seals effectively keep grease in, dirt out.
Sturdy, compact cast housing requires minimum support space.
Slotted bolt holes facilitate mounting on supporting structure.

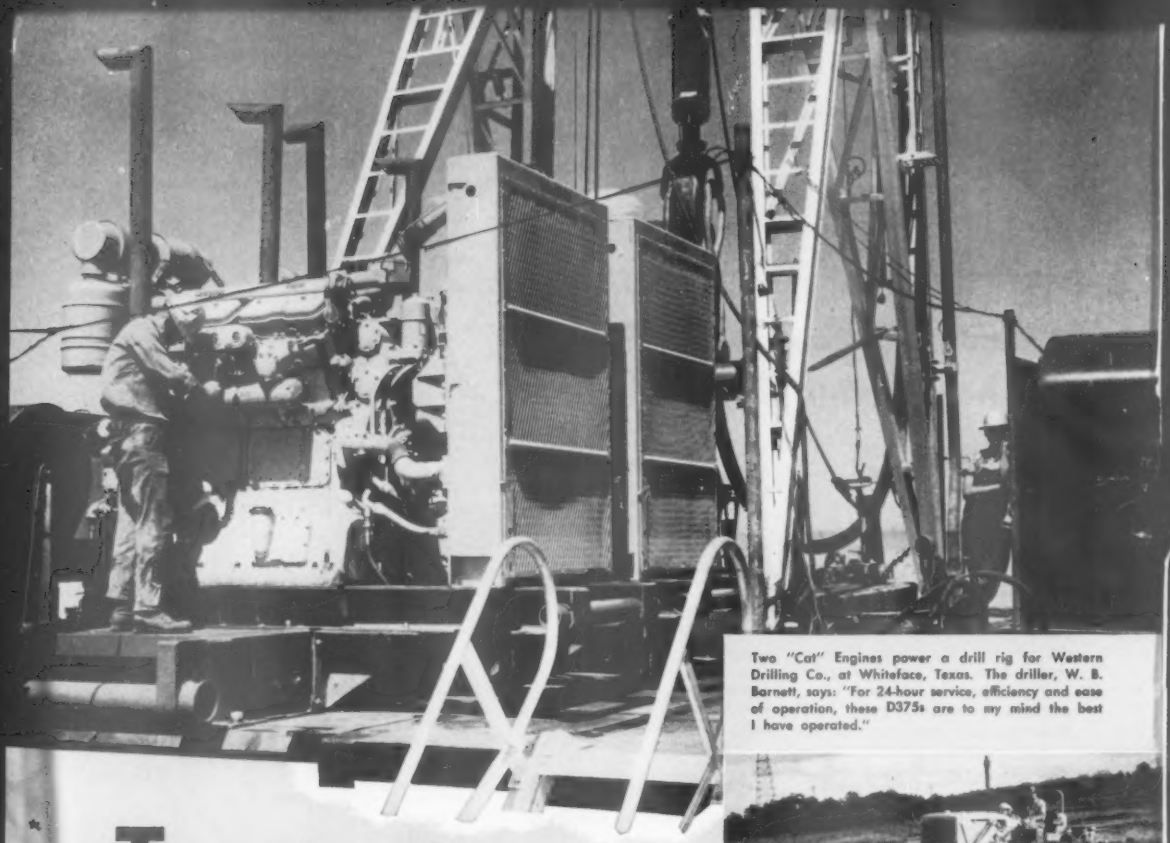
One of many types in the Link-Belt line of Pillow Blocks, Flanged, Flanged Cartridge, Cartridge, Hanger, Take-up Blocks and Unmounted Bearings.

LINK-BELT

BALL and ROLLER BEARINGS

LINK-BELT COMPANY: Indianapolis 6, Dallas 1, Houston 1, Los Angeles 33, Kansas City 8, Mo., New York 7, Toronto 8. Distributors in all fields. 12,098

The Oil and Gas Journal, published Mondays, copyright 1952, by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $4 yearly.



Two "Cat" Engines power a drill rig for Western Drilling Co., at Whiteface, Texas. The driller, W. B. Barnett, says: "For 24-hour service, efficiency and ease of operation, these D375s are to my mind the best I have operated."

There's oil in their blood

A "Cat" D7 Tractor with No. 7A Bulldozer is used for backfilling slush pits and leveling off the lease after drilling is completed, near Daisetta, Texas.

"Caterpillar" Diesels are bred and born for oilfield work. Right down the line—"Cat" Engines—Tractors—Bulldozers—Motor Graders—they're built to take on the world's toughest jobs and lick them. Durable, dependable, economical to operate, they're winners in every phase of oil and gas production. And their long work life is backed by the reliable service of "Caterpillar" Dealers everywhere.

CATERPILLAR, PEORIA, ILLINOIS

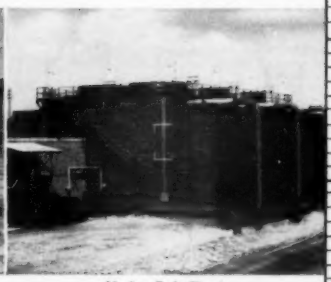
At the Sunray Oil Corp. refinery, near Snyder, Texas, this "Caterpillar" Diesel No. 212 Motor Grader builds roads and finishes a parking area.

CATERPILLAR

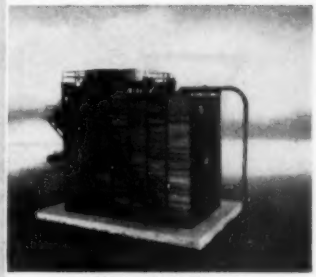
REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

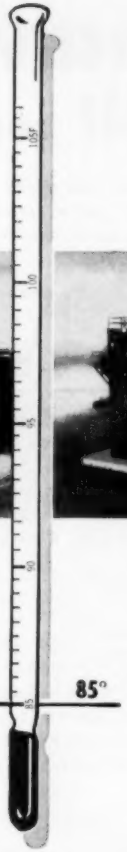
Marley Double-Flow*



Marley Twin-Flow*



Marley Single-Flow



It costs less down here

with MARLEY
Cross-Flow Cooling

Exclusive design features utilized only by the Marley modern method of water cooling produces operating economies possible with no other type of tower. Open gravity-flow distribution, conservative tower heights, full height louvered sides, horizontal air flow with lowest static pressure loss, all combine to do the job.

Hot water is distributed with minimum pumping head; it is broken up and retained on its fall through the Marley MortisLocked filling for the longest, most complete air-water contact. That means performance—the ability to meet design specifications.

Complete accessibility of every part of Marley towers means hundreds of hours saved on inspection and maintenance. Long life of Marley designed and manufactured mechanical equipment, and the rugged structural strength built into every Marley tower are other important factors in making the evaluated cost of cool water lowest with Marley Cross-Flow cooling.

*Registered Trade Name

producers of

DOUBLE-FLOW TOWERS
AQUATOWERS
DOUBLE-FLOW AQUATOWERS
DRICOOLERS
NATURAL DRAFT TOWERS
CONVENTIONAL TOWERS
SPRAY NOZZLES

MARLEY

The Marley Company, Inc.

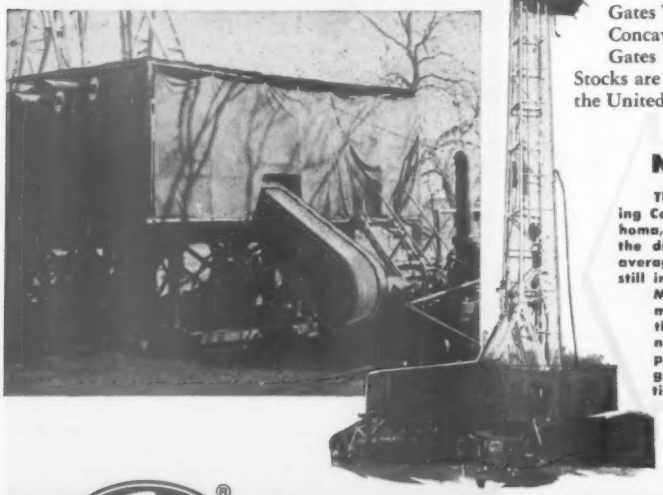
KANSAS CITY 5, MISSOURI

How concave sides cut V-Belt costs

Important to anyone who wants to cut V-Belt replacement costs is the simple, interesting reason WHY Gates Vulco Ropes are built with *Concave Sides* (U. S. Patent 1813698). See Figure 1.

When a Gates belt is bent around a sheave these Concave Sides fill out to full, even contact with the sides of the sheave groove. (Figure 1A). This gives you sure pulling power. And, naturally, because wear is distributed evenly, the Concave Sides actually give you longer wear—longer belt life. That cuts V-Belt replacement costs.

On the other hand, when a straight sided V-Belt (Figure 2) is bent, the sides bulge out, preventing the belt from fitting evenly in the sheave groove. This causes *extra wear* at the points shown by arrows. (Figure 2A).



Make this simple test yourself...

Hold a straight sided V-Belt as it would be bent around a sheave. Take the sides of the belt between your finger and thumb. You can *feel* bulges in the sides—the bulges that prevent an even fit in the sheave groove and cause extra wear.

Now do the same thing with a Gates Vulco Rope. You can feel the sides fill out. You can see why they press firmly and evenly against the sides of the sheave groove—giving you longer belt life—lower belt costs.

When you buy V-Belts be sure to get Gates Vulco Ropes—the V-Belts with the Concave sides.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

No Belt Costs in 4 Years

The mud pump drive on this Nelson Drilling Company rig operating near Fox, Oklahoma, was installed July 7, 1948. Since then, the drive has helped drill 75 wells to an average depth of 4750 feet and the belts are still in excellent running condition.

Mr. Nelson says, "These belts have given me almost 4 years of continuous use and they haven't cost me a dime for maintenance. I have just purchased a new mud pump for another rig and, of course, I am going to put Gates belts on this installation."

CS-526-E

Gates® VULCO® ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker of V-Belts

The oil industry had its dark ages too . . .

WE KNOW — WE WERE THERE

The oil business was once in the dark ages. Using crude, blacksmith-fashioned tools of many varieties, men punched holes in the Pennsylvania earth in search of black gold.

When found, it had to be stored. This inspired Adam Black to start what eventually became Black, Sivalls & Bryson, Inc. After a full day's work elsewhere, young Black would go to his father's barrel making shop. While his wife held a kerosene lantern he would spend the evening making wood storage tanks for oil.

Black teamed with Jim Sivalls and the two followed oil westward to join W. G. Bryson. The three set out to manufacture the best oil storage tank of that day. Increased oil production turned them to producing tanks of steel. The BS&B emblem became almost as familiar as the oil derrick. Today this is still true.

BS&B has grown up in, and with, the oil business. Since those early days the company has designed and manufactured a great percentage of the most widely accepted and used oil and gas processing equipment known to the industry. This steady progress has been made possible by the right kind of men . . . men who like the original trio . . . Black, Sivalls and Bryson . . . maintained initiative, constantly sought new knowledge, and kept up with the ever changing oil business. Wherever there's an oil patch you'll find BS&B represented. It may be just a tank . . . or it may be a large battery of separators . . . perhaps the new BS&B Glycol Injection System . . . maybe a S abilizer . . . or it could be many others.

BLACK, SIVALLS & BRYSON, INC.

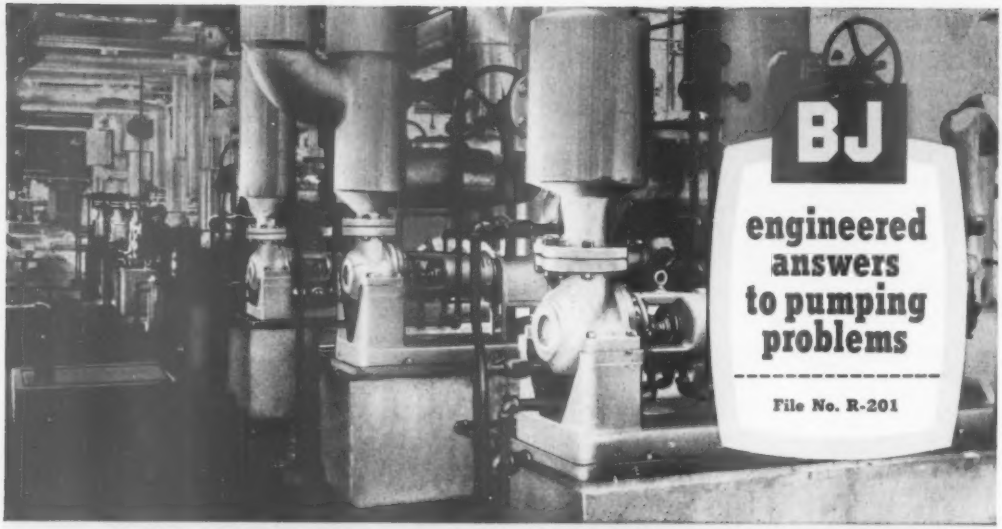
Oil & Gas Equipment Division — Dept. 1-A7

2131 Westwood Blvd. — Oklahoma City, Oklahoma

EFFICIENCY **BS&B** RELIABILITY

This is our 60th Year

TODAY — Bolted Steel Tanks . . Welded Steel Tanks . . Wood Tanks . . Oil and Gas Separators . . Free Water Knockouts . . Low Temperature Separation Units . . Stabilizers . . Heaters . . Emulsion Treaters . . Gas Dehydrators . . Gas Desulfurizers . . Chemical Feeders . . Walkways and Stairways . . Automatic Control Equipment . . Safety Heads . . Special Fabrication



First packaged TCC Unit features 20 BJ PUMPS...

The world's first packaged TCC unit, recently completed at Artesia, New Mexico, is a boon to the refiner of 12,000 barrels per stream day or less. This packaged plant—including feed preparation, catalytic cracking section, fractionation, gas plant and catalytic polymerization—increases gasoline yield and improves anti-knock rating at a cost factor which compares with much larger units.

In this unique installation Byron Jackson pumps of various types and sizes are used. In fact, of the 23 centrifugals installed, 20 are BJ pumps!

Whether you are concerned with pumps for a complete new refinery or a single replacement pump in an established operation, it pays to work with BJ. BJ's specialized knowledge and extensive line of refinery pumps assure you the *right* answer to your need.

Byron Jackson Co.
Since 1872
P. O. Box 2017, Terminal Annex, Los Angeles 54, California
OFFICES IN PRINCIPAL CITIES

FILE FACTS:

- Designed and built by the Southwestern Engineering Co., working with Socony Vacuum Oil Co., inventors and developers of the TCC process.
- Built for the New Mexico Asphalt and Refining Co., Artesia, New Mexico.
- Fresh feed capacity—6,000 bbl. per stream day of gas oil, operating at approximately 55 per cent conversion level.

No. of Units	Type of Pump	Capacity	HP	Application and Product Handled
2	2x3x11 H Fig. 1050	215 gpm	50	Charge Pump—Handles crude oil
1	3x4x8 H SM Process	310 gpm	20	Quench Oil Pump—Handles 650°F cycle oil
5	2x3x11 L Fig. 1050	100 gpm	30	Fractionator Reflux and Absorber Charge and Stabilizer Reflux Pumps with Type "U" Mechanical Seals
1	2x3x12½ H SM Process	110 gpm	40	Flasher Bottom Pump—Handles 725°F Residuum
1	3x4x8 L SM Process	180 gpm	10	Re-boiler Oil Pump—Handles gas oil
2	1½x2x8 H SM Process	45 gpm	5	Catalytic Poly Stabilizer Reflux Pump—Handles Butanes (Pumps have Type "U" Mechanical Seals)
1	1¼ TLM Bilton	30 gpm	5	Poly Reactor Wash Pump—Handles water
2	24 KXH Vertical Circulating	6000 gpm	250 and Turbine	Cooling Tower Pumps—Handles Cooling Tower Water for entire plant (Turbine drives through Philadelphia Right-Angle Gear)
2	1½ TLM Fig. 1025	105 gpm	2	Top and bottom Absorber Intercooler Pumps—Handles light hydrocarbons (With BJ Type "U" Mechanical Seal)
1	2x3x12½ H SM Process	64 gpm	30	Recycle Pumps—Handles recycle oil
1	3x4x8 H SM Process Pump	}	These pumps are used as common spares for the above services.	
1	2x3x12½ H SM Process Pump	}		

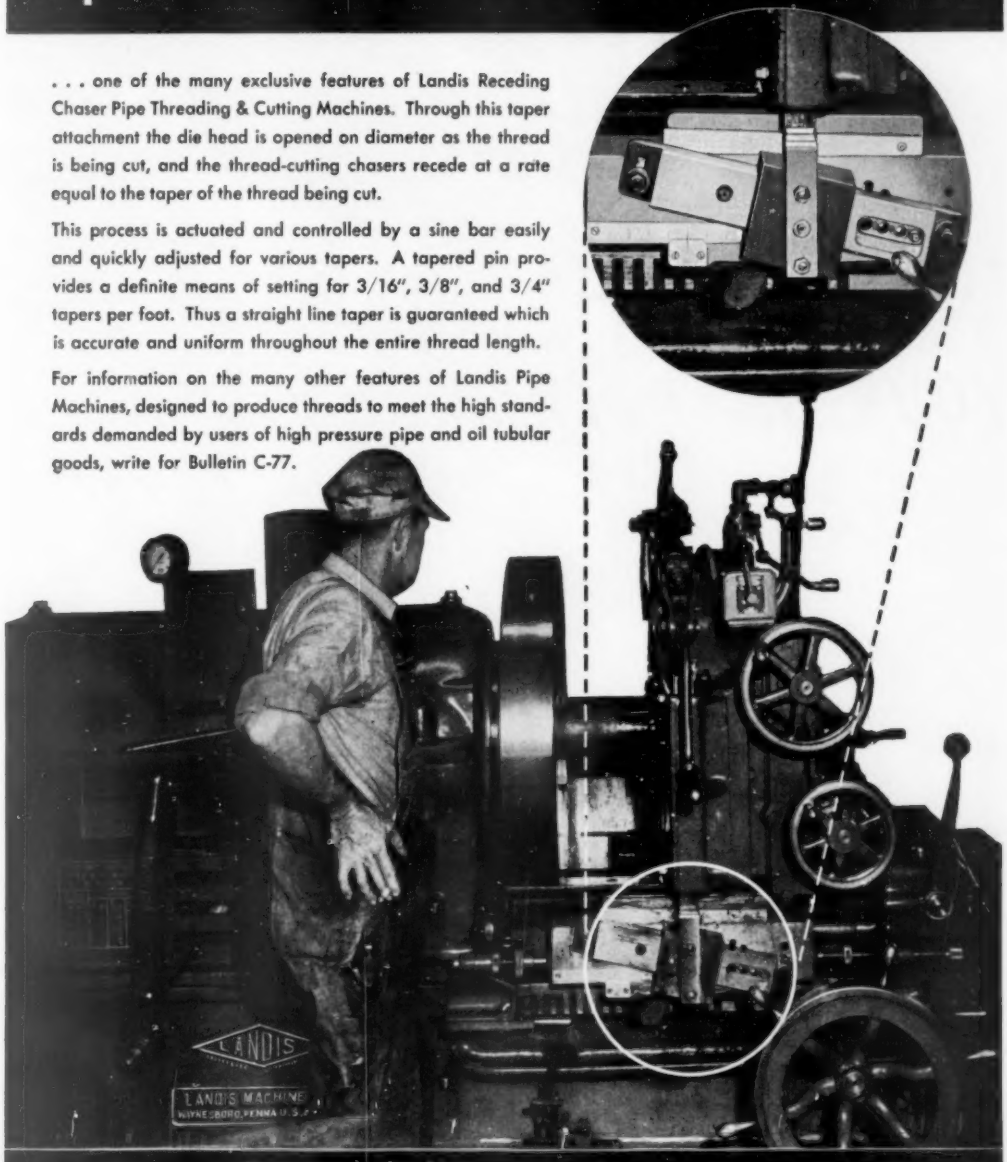
TOTAL BJ PUMPS AT REFINERY—20

Receding Mechanism Guarantees Tapered Pipe Threads To Closest Tolerances . . .

. . . one of the many exclusive features of Landis Receding Chaser Pipe Threading & Cutting Machines. Through this taper attachment the die head is opened on diameter as the thread is being cut, and the thread-cutting chasers recede at a rate equal to the taper of the thread being cut.

This process is actuated and controlled by a sine bar easily and quickly adjusted for various tapers. A tapered pin provides a definite means of setting for 3/16", 3/8", and 3/4" tapers per foot. Thus a straight line taper is guaranteed which is accurate and uniform throughout the entire thread length.

For information on the many other features of Landis Pipe Machines, designed to produce threads to meet the high standards demanded by users of high pressure pipe and oil tubular goods, write for Bulletin C-77.



LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

IT TAKES MORE THAN A

Shoestring

TO FINANCE

YOUR OIL OPERATIONS

The costs involved in every petroleum industry operation are not new to the experienced oil loan officers at NBT. These men have been dealing with the oil man's problems for years and have what it takes to be of keen assistance in untying those financial "knots." And, with the benefit of National Bank of Tulsa's large resources and "know-how," you have assurance of prompt, friendly, dependable service at all times.

The Oil Bank of America

NATIONAL BANK OF TULSA

OFFERING COMPLETE BANKING AND TRUST SERVICES

Member Federal Deposit Insurance Corporation

LESS COST PER FOOT

LESS COST PER FOOT
CHRISTENSEN
DIAMOND PRODUCTS

CHRISTENSEN

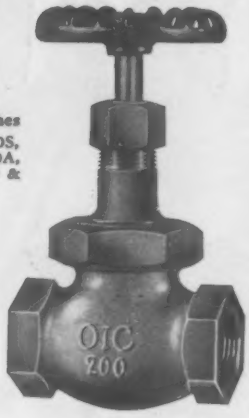
DIAMOND PRODUCTS CO.

1937 SOUTH 2nd WEST • PHONE 6-8738 • SALT LAKE CITY, UTAH

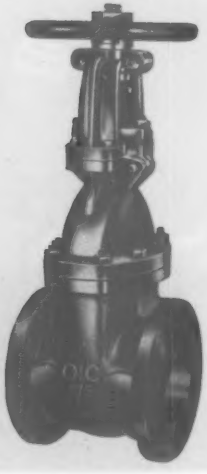
OIC FOR

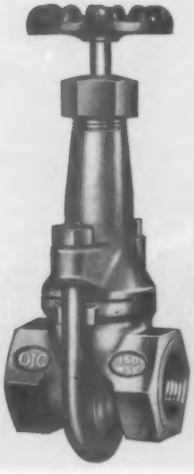
GATES, GLOBES, ANGLES, CHECKS
There's this long line to choose from . . .

BRONZE



⅛-inch to 3-inches
125S, 150S, 200S, 300S, 350S, 300A, 200, 400, 2000 & 2500WOG.



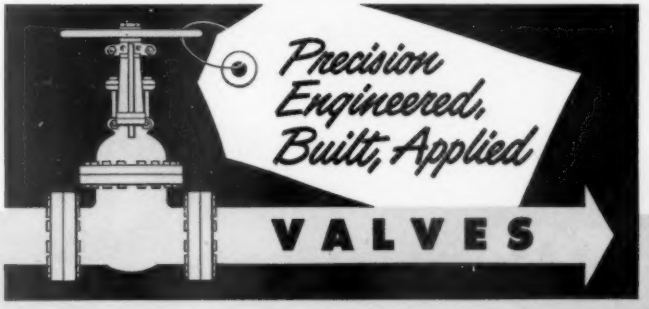


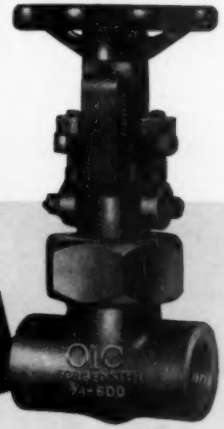
IRON

1¼-inch to 16-inches
125S, 150S, 250S, 175, 200, 400 & 500 WOG.
CLIP GATES—¼-inch to 4-inches.

OIC
FOUNDED 1883

ANY VALVING REQUIREMENT

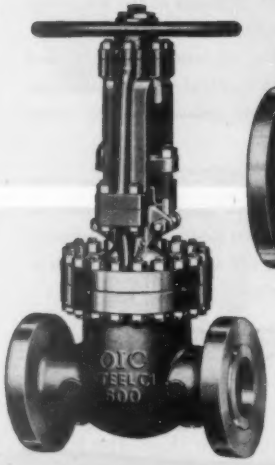




FORGED STEEL

¼-inch to 2-inches
600 primary pressure series.

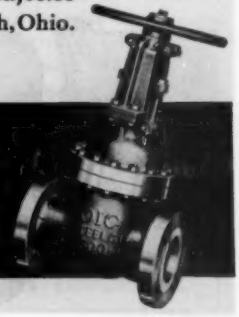
CAST STEEL



2 inches to 16 inches
150, 300 and 600 primary pressure series.

Screwed, flanged, butt weld and socket weld ends . . . rising and non-rising stems . . . outside screw and yoke . . . alloy metal seats, discs and wedges, composition discs . . . union, inside screw and bolted bonnet . . . tapered and parallel seat wedges.

If you're needing valve application know-how, call the nearby OIC distributor or write direct to us. The Ohio Injector Company, Wadsworth, Ohio.



VALVES

FORGED AND CAST STEEL • IRON • BRONZE

Oil and gas men know the importance of "bone dry" petroleum products. They also know that ALCOA *Activated* Alumina is one of the oldest . . . most reliable . . . thoroughly proved drying agents in the petroleum industry.

ALCOA *Activated* Alumina, earning its reputation the hard way, has *proved* its superiority, year-in, year-out, in hundreds of steady, reliable dehydration jobs. Particularly efficient in drying furnace oil and gasoline, instrument air and other gases, it has effectively solved the problems of moisture in finished products in storage or in pipe lines.

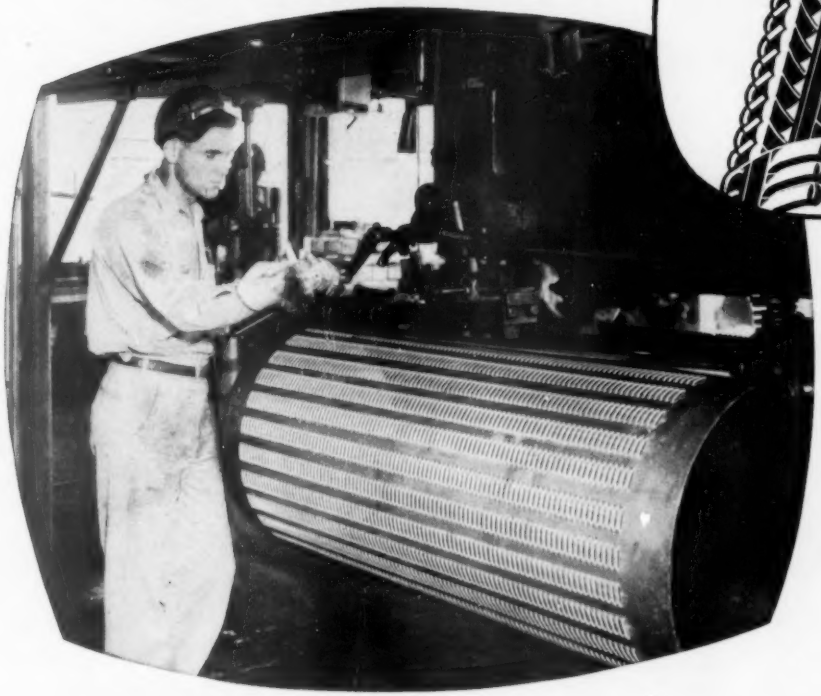
ALCOA *Activated* Alumina is highly adsorptive . . . easy to handle . . . abundantly available . . . and easily regenerated. It is one of the few desiccants that will not shatter on contact with water. It has high resistance to crushing, shock and abrasion. Moreover, this highly inert aluminum oxide dries to *lower dew points* than any other commercial adsorbent!

ALCOA *Activated* Alumina can speed up your processes . . . can save *your* money. Let us tell you how. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 618-G Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA TELEVISION—CBS Network, 6:30 to 7:00 P.M. EDST every Sunday on most stations—8:30 to 9:00 P.M. in far West.

Screen Making

looks mighty simple



• • The outstanding features of Layne constructed wells and pumps are pictured and described in a catalog entitled "Layne Well Water Systems." A copy will be sent on request.

Screen Making—is simply a matter of making the right kind of openings of the right shape in the right arrangement in the right metal to fit into the well in the right manner so that the right amount of water can enter the pump bowl area with a minimum amount of resistance while holding back the sand formation. Outside of those details the job is quite simple.

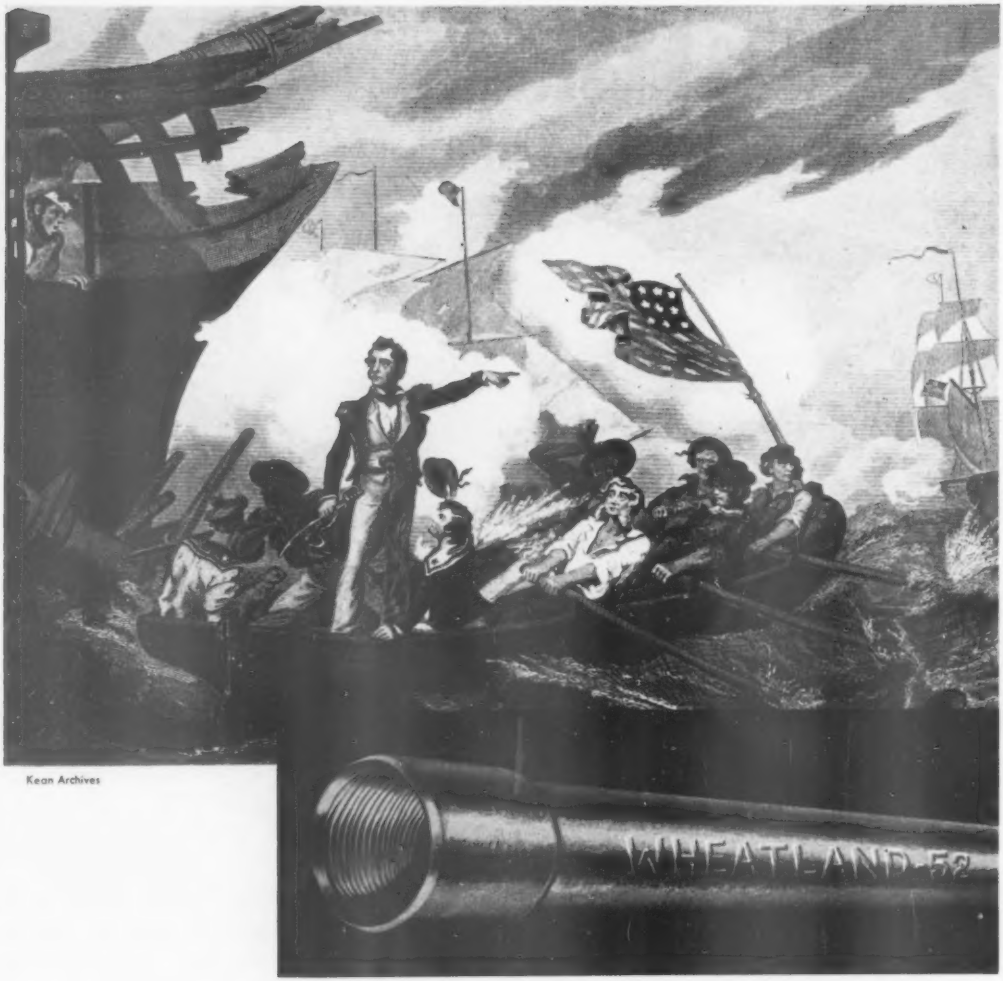
And the right kind of screen in a well is about as important as is the right kind of motor in an airplane. Fifty years ago, Layne bucked the screen problem and came up with something that hasn't been matched by any other manufacturer.

If Layne builds your water supply units and if sand screen is necessary, your job will have the famous Layne horizontally slotted screen. This means that your well will have a longer life, produce more water and operate on a lower cost than is possible with ordinary conventional screens.

For further information about water wells and complete water supply installations with Layne sand screens, address

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

Layne
WATER WELLS
VERTICAL TURBINE PUMPS
WATER TREATMENT



Kean Archives

PIPE WITH THE YEARMARK

IMPORTANT DATES IN HISTORY

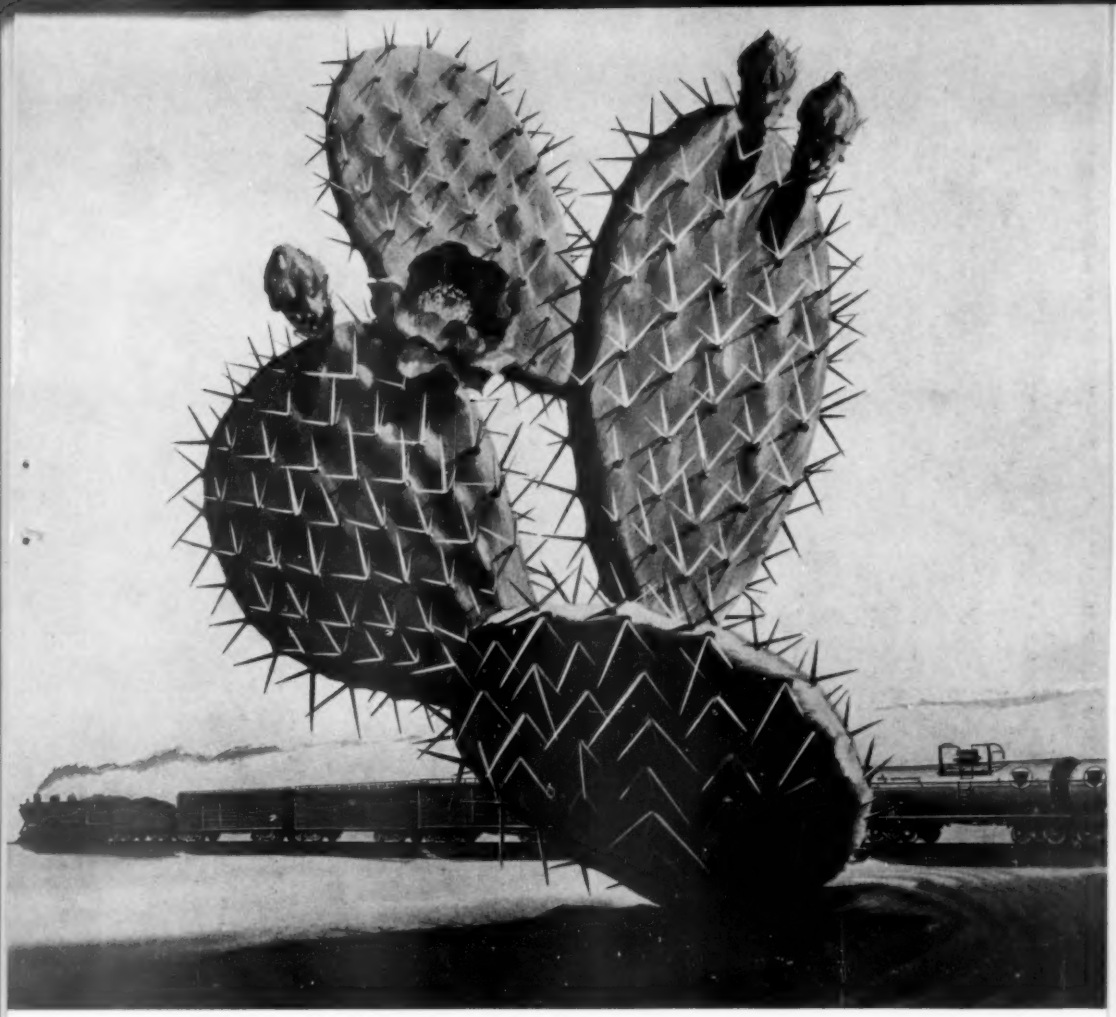
Famed in American history is the phrase, "Don't Give Up The Ship". These immortal words were spoken in 1813 by Commodore Perry. This date marks another important event in the growth of America.

The Wheatland Tube Company stands behind the date on each length of pipe produced in their mills. Constant testing for precision, for quality, for dependability, make this date an important one for you for it is your assurance of strength!

WHEATLAND STEEL PRODUCTS COMPANY

BANKERS SECURITIES BUILDING, PHILADELPHIA 7, PA.

Scrap is urgently needed to help keep America strong and free. Do your part — get in your scrap today!



We're shipping from Texas now!

Cars of "Ethyl" antiknock compound are now starting to roll out of our new Texas plant.

In case you haven't heard the full story of this new plant . . . we have just completed a new antiknock compound manufacturing center on the Houston ship channel in Texas. It's the most modern plant of its kind in the world . . . the only one west of the Mississippi.

(*continued on next page*)

ETHYL

We're shipping from Texas now!

(*continued from preceding page*)

This new plant greatly increases Ethyl's manufacturing capacity, and our ability to serve the nation's petroleum industry. It's a completely "integrated" plant. All the complex chemicals needed to produce tetraethyllead are made here from raw materials such as salt, pig lead, petroleum gases and electricity. The location of the new plant was picked to be near these basic raw materials.

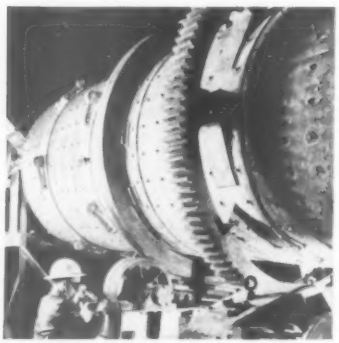
Today, we can dispatch Ethyl fluid to you from any one of *four* shipping points, Baton Rouge, Louisiana; Houston, Texas; Edge Moor, Delaware; and Wilmington, California. Refiners are now, more than ever before, assured of a dependable supply of "Ethyl" antiknock compound delivered where and when they want it.

ETHYL CORPORATION

NEW YORK 17, NEW YORK

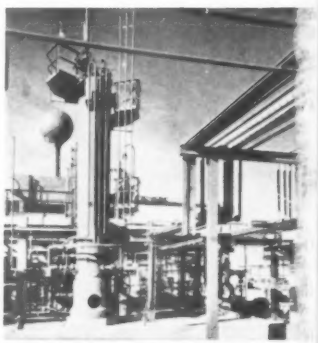
Ethyl service is backed by 29 years of antiknock experience

HERE ARE A FEW OF THE MANUFACTURING UNITS IN OUR NEW TEXAS PLANT



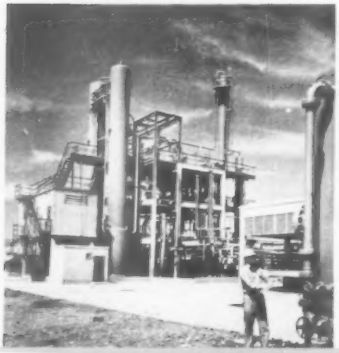
A SALT DRYER IN THE SODIUM BUILDING

HIGH-VOLTAGE LINE FOR SODIUM CELLS

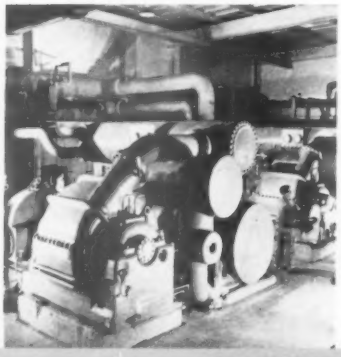


THIS IS THE ETHYL DICHLORIDE PLANT

THE ETHYL CHLORIDE UNIT IS A PLANT IN ITSELF



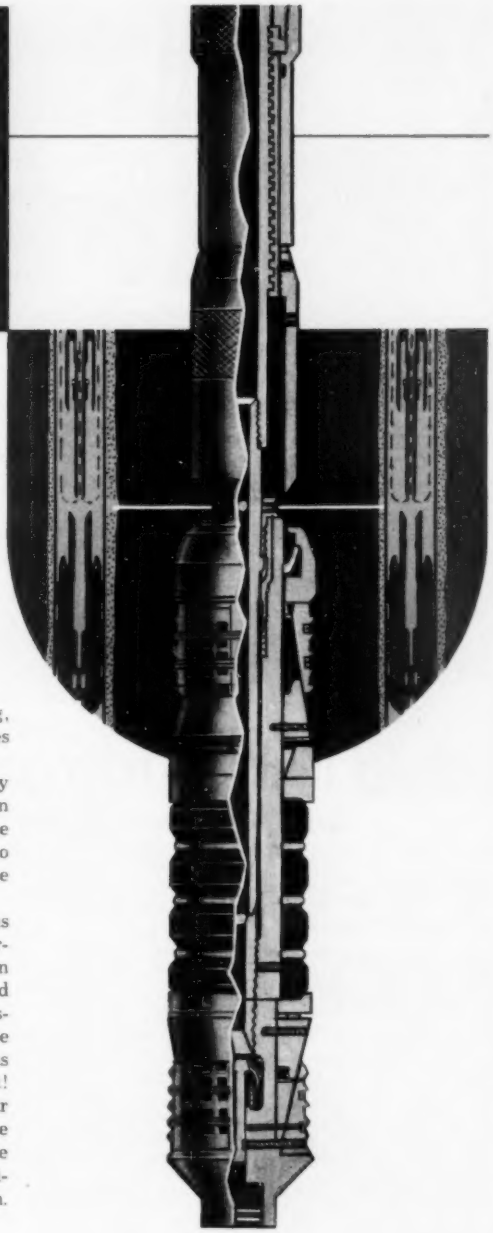
REFRIGERATION COMPRESSORS IN THE ETHYL CHLORIDE UNIT



TETRAETHYLLEAD MANUFACTURING BUILDING

DEEP SQUEEZE SAFELY

with utmost simplicity



HALLIBURTON'S DM AND DC SQUEEZE PACKERS!

Designed and built for dependable deep squeezing, Halliburton's Drillable Packers offer many advantages preferred by operators who know about them.

Mechanical simplicity assures easy, positive setting by simply rotating the tubing before picking up. Halliburton Packers remain open until set and can circulate or reverse the circulation at any time while running in. No threads to unscrew after setting . . . tubing and circulation valve are free from packer before squeezing begins!

The preferred Halliburton circulating valve contains no ports, helps eliminate the danger of clogging and interrupted circulation. Improved slips, positively locked in place until the packer is set, automatically release and hold securely in any casing with minimum danger of distorting old or lightweight casing. The back pressure valve assures a positive seal even though an object as large as ⅛" in diameter is lodged between the valve and the seat!

Deep Squeeze safely with utmost simplicity on your next squeeze job. DM and DC Squeeze Packers assure more satisfactory results and all around economy. Phone your nearby Halliburton representative. Or write Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

TYPE DM is precision built of high strength drillable magnesium alloy for squeezing or temporary bridge plug use.

TYPE DC is identical in construction of high strength drillable cast iron for permanent bridge plugs, temporary bridges, and all squeeze jobs.

HALLIBURTON

YEARS AHEAD IN SQUEEZE CEMENTING!

"Dodge trucks are really rated for our job!"

. . . says **L. M. HOLBROOK**, *Holbrook & Son, Santa Fe Springs, Calif.*

"Hauling rotary mud from oil fields is mighty rugged work," says Mr. Holbrook. "So it requires a truck with plenty of power.

"We carry more than 40,000 pounds of mud over makeshift roads in all kinds of weather. That kind of work just naturally calls for a Dodge. Why—with all that Dodge *'Job-Rated'* power, our work is *easy!*

"Take it from me, Dodge trucks are really rated for our job! They're powerful, dependable and economical to run."

You'll find that enthusiastic statements such as Mr. Holbrook's are an everyday occurrence among men in the oil fields. They're discovering the extra power and dependability of heavy-hauling Dodge *"Job-Rated"* trucks. Further, they have discovered that because a Dodge truck is *"Job-Rated"*—factory-engineered to fit a specific job—it assures the best in low-cost transportation for many years to come.

Consider the big Dodge 4-tonner, for example. Its husky, 154-hp. engine provides plenty of power for toughest jobs. Low fuel and maintenance bills are a certainty . . . thanks to Dodge extra-value features like 4-ring pistons and intake and exhaust valve seat inserts—plus twin carburetion and exhaust system. You can pack far bigger payloads without overloading, too, because of better weight distribution.

Chances are you'll want to gather in more facts for yourself on powerful Dodge *"Job-Rated"* trucks. If so, there's a cheerful chap close by who'll be happy to help solve your hauling problems. He's that neighborly Dodge dealer. And his door always stands open in welcome helpfulness.

DODGE "Job-Rated" TRUCKS

The practical way to save pipes, tanks, derricks, buildings, pumps, roofs, fences

STOP RUST! with RUST-OLEUM

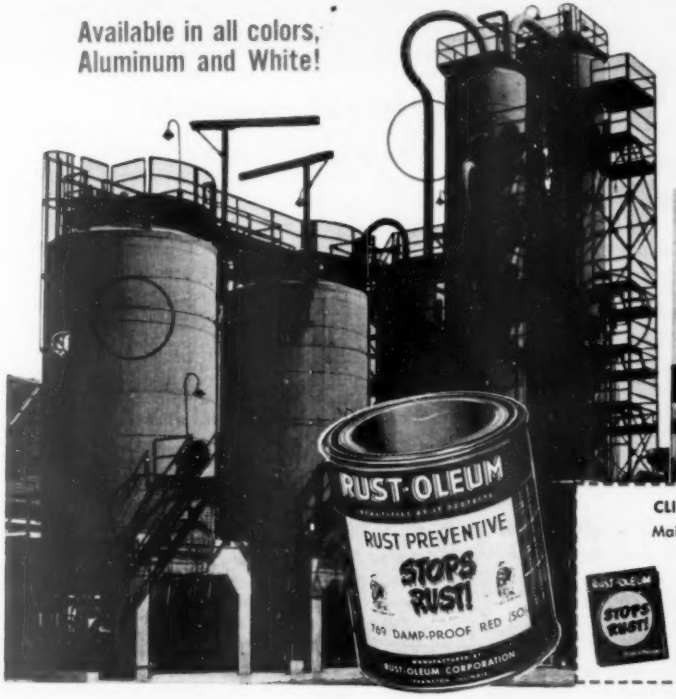
RUST-OLEUM is the *practical, sensible* answer to your rust problems. Cuts your maintenance costs, because it may be applied *directly over rusted surfaces* after wirebrushing and scraping with sharp scrapers to remove rust scale and loose particles . . . costly sandblasting and chemical pre-cleaning are not usually required. This often enables *one man* to do the work of two with RUST-OLEUM! Practical, too . . . because RUST-OLEUM beautifies as it protects in *all colors, aluminum,* and *white.*

We'll be happy to show you convincing proof that RUST-OLEUM can cut your maintenance costs . . . and last longer when applied over rusted surfaces. Get the facts, today! Prompt delivery from Industrial Distributor stocks in principal cities in the United States and Canada.

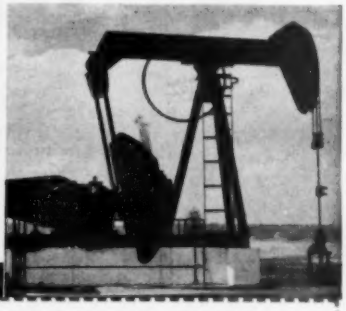
RUST-OLEUM CORPORATION
2543 Oakton Street, Evanston, Illinois

May be applied directly over rusted surfaces without removing all the rust!

Available in all colors, Aluminum and White!



Dries to a tough, elastic coating that resists fumes, moisture, heat, weathering, most acids and chemical dusts

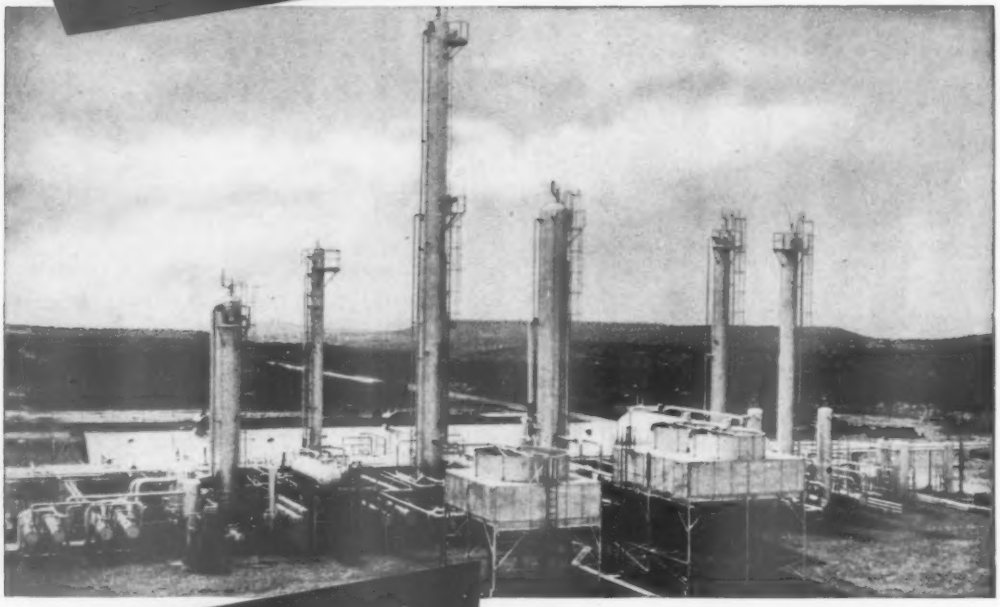


CLIP THIS TO YOUR LETTERHEAD

Mail To: Rust-Oleum Corporation
2543 Oakton Street
Evanston, Illinois

- ☐ Have A Qualified Representative Call
- ☐ Full Details On Free Survey
- ☐ Complete Literature
- ☐ Nearest RUST-OLEUM Source

Reduce Fouling in your plant



with **BROWN FINTUBE** *sectional hairpin heat exchangers*

● Brown Sectional Heat Exchangers, with their integral one-piece extended surface fintubes, reduce fouling, just a few hundredths of an inch of which on a tube causes a major loss in heat transfer efficiency.

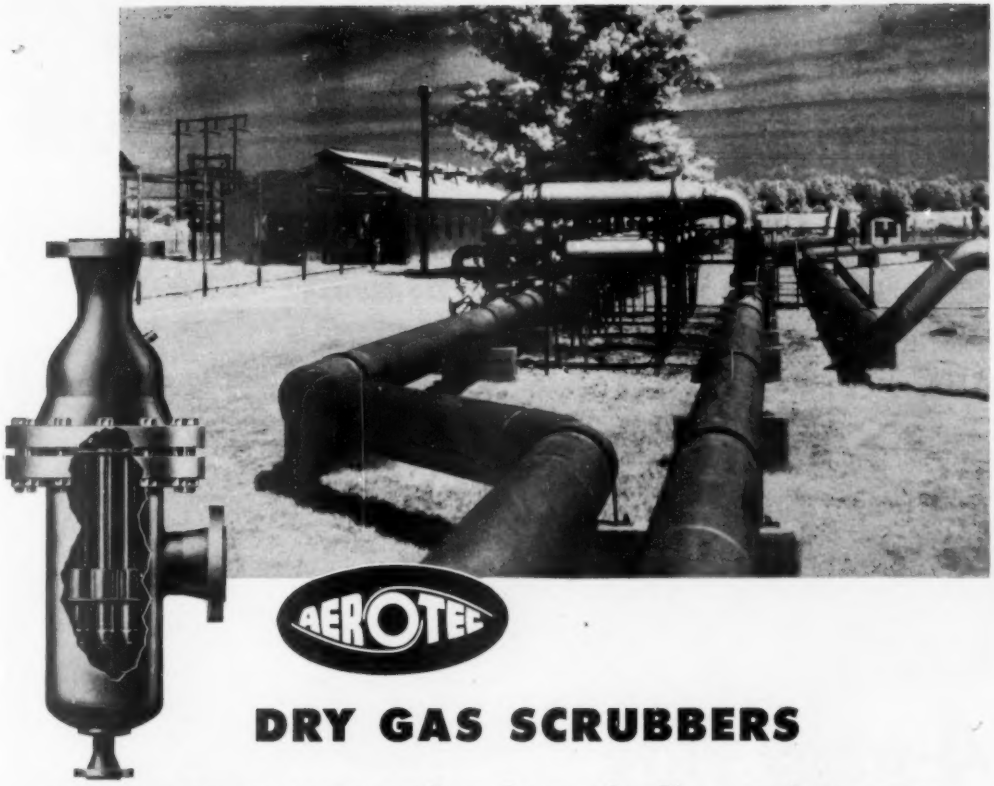
These exchangers assure efficient operation at low "skin" temperatures, minimizing coking and building up on the fintubes. And the controlled flow through the longitudinal passages keeps all the material in continuous motion. There are no baffles, back-eddies or stagnant areas to encourage fouling.

For top operating efficiency and reduced fouling use Brown Sectional Heat Exchangers throughout your plant. ***Write for Bulletin No. 512.***

THE BROWN FINTUBE CO.
Elyria, Ohio

Sectional Hairpin Heat Exchangers
Tank Suction and Line Heaters
Fintube Heaters for Bulk Storage Tanks
Indirect Process Air Heaters
Fintube Heaters for Processing Tanks
Integrally Welded Fintubes for Any Heating, Cooling or Heat Transfer Service

NEW YORK • BOSTON • PHILADELPHIA • WILMINGTON • PITTSBURGH • BUFFALO • CLEVELAND • CINCINNATI • DETROIT • CHICAGO
ST. PAUL • ST. LOUIS • MEMPHIS • BIRMINGHAM • NEW ORLEANS • TULSA • HOUSTON • LOS ANGELES • SAN FRANCISCO



AEROTEC

DRY GAS SCRUBBERS

protect compressors and reduce pipeline maintenance

Dusts and distillates in natural gas put an unnecessary drag on profitable pipeline operation. Aerotec Dry Gas Scrubbers get rid of these damaging impurities with high efficiency, thereby reducing maintenance to a minimum. This is a proven fact in well and pipeline installations across the country.

The Aerotec Scrubber, unlike conventional types, uses no liquid filtering medium. Hence, you eliminate carryover of elements that cause compressor wear. You also avoid other difficulties normally encountered with wet-bath scrubbing methods. The Aerotec units assure clean, *dry* gas that flows freely and saves on repair and maintenance costs.

Basis of this efficiency is a unique method of scrubbing gas by the use of multiple, small-diameter tubes. Through the principle of dry separation by centrifugal force, foreign solids and liquids are precipitated, leaving the gas clean and dry.

Simplified piping permits easy installation of the compact, lightweight Aerotec Dry Gas Scrubber. Standard units up to 100,000,000 SCFD are available, with larger capacity requirements met by manifolding. For technical data and engineering assistance in selecting the Aerotec Scrubber best suited to your gas-cleaning needs, call or write our representatives today.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.

(Offices in 38 Principal Cities)

Canadian Affiliates: T. C. CHOWN, Ltd., Montreal and Toronto

Manufacturers

THE AEROTEC CORPORATION

GREENWICH, CONN.

BIG Tractor-shovel with BIG push

4-wheel drive PAYLOADER®

The big 1½ cu. yd., 75 horsepower Model HM "PAYLOADER" has proven itself in the oil industry as a valuable, versatile earth mover. It gets to the job faster under its own power at speeds up to 16 mph . . . has traction and flotation to work on poor grounds . . . can excavate, load trucks, backfill, bulldoze, spread, pull, push, lift and carry. It's a many-purpose handyman for the pipe liner, the driller and the refiner.

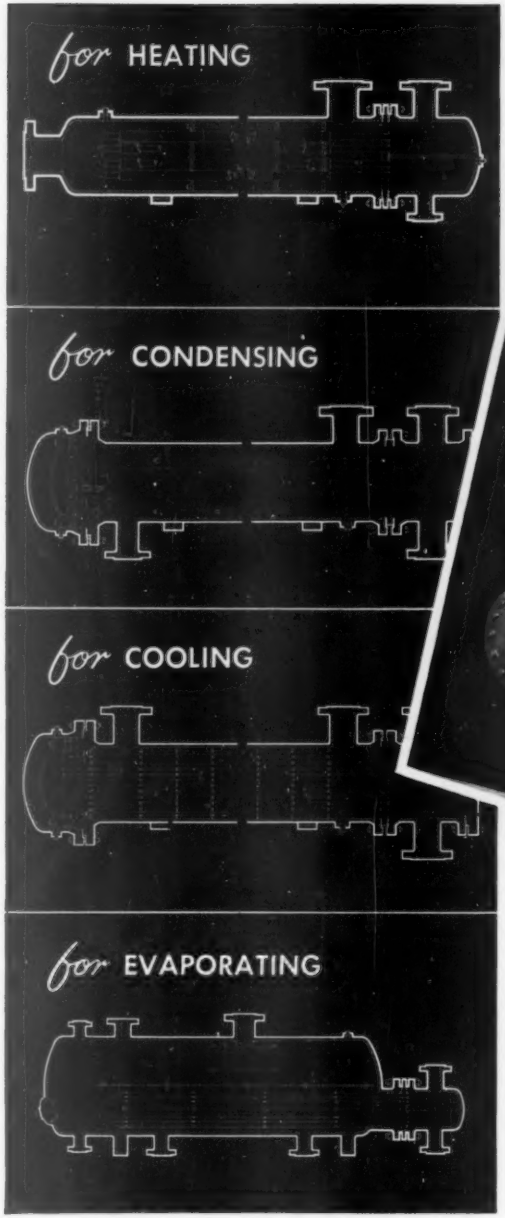
This tractor-shovel also makes a hit with operators because it rides easy and has a big comfortable seat, power-boosted steering and fingertip hydraulic control. Four speeds *reverse* as well as forward permit as fast operation in both directions as the job conditions allow, and there's a choice of gasoline or diesel power. Once you've seen a Model HM in action you'll understand why hundreds of owners and operators are its enthusiastic boosters.

The Frank G. Hough Co., 749 Sunnyside Ave., Libertyville, Ill.

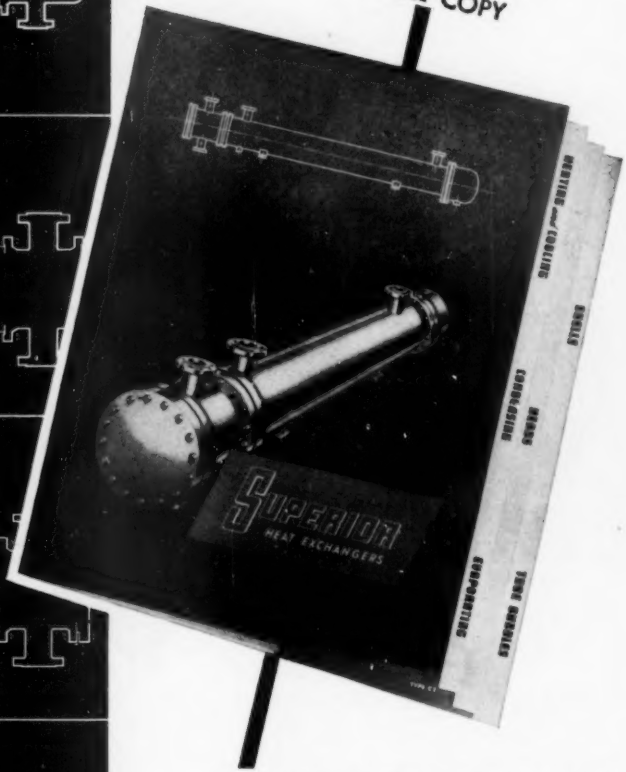
WRITE for catalog on the 1½ yd. Model HM or the six other "PAYLOADER" sizes down to 12 cu. ft. bucket capacity.

PAYLOADER®

THE FRANK G. HOUGH CO. — Since 1920



WRITE FOR **YOUR** COPY



Whether you use heat exchangers for heating, cooling, evaporating or condensing, you'll find help in this informative bulletin describing SUPERIOR Heat Exchangers.

Its clear-cut drawings illustrate the basic components of efficient heat exchanger design, providing the basis for the specification of heat exchangers for almost every industrial application.

To obtain *your* copy, write for Bulletin 520.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 18, N.Y.

SUPERIOR
HEAT EXCHANGERS

IT'S PACKED WITH SATISFACTION WHEN IT'S PACKED WITH R/M

In the widely diversified line of Raybestos-Manhattan packings and gaskets, you will find products specially made to solve your toughest packing problems. Let your nearby R/M distributor help you specify the packings that will assure you of long trouble-free operation. Give him a call today.

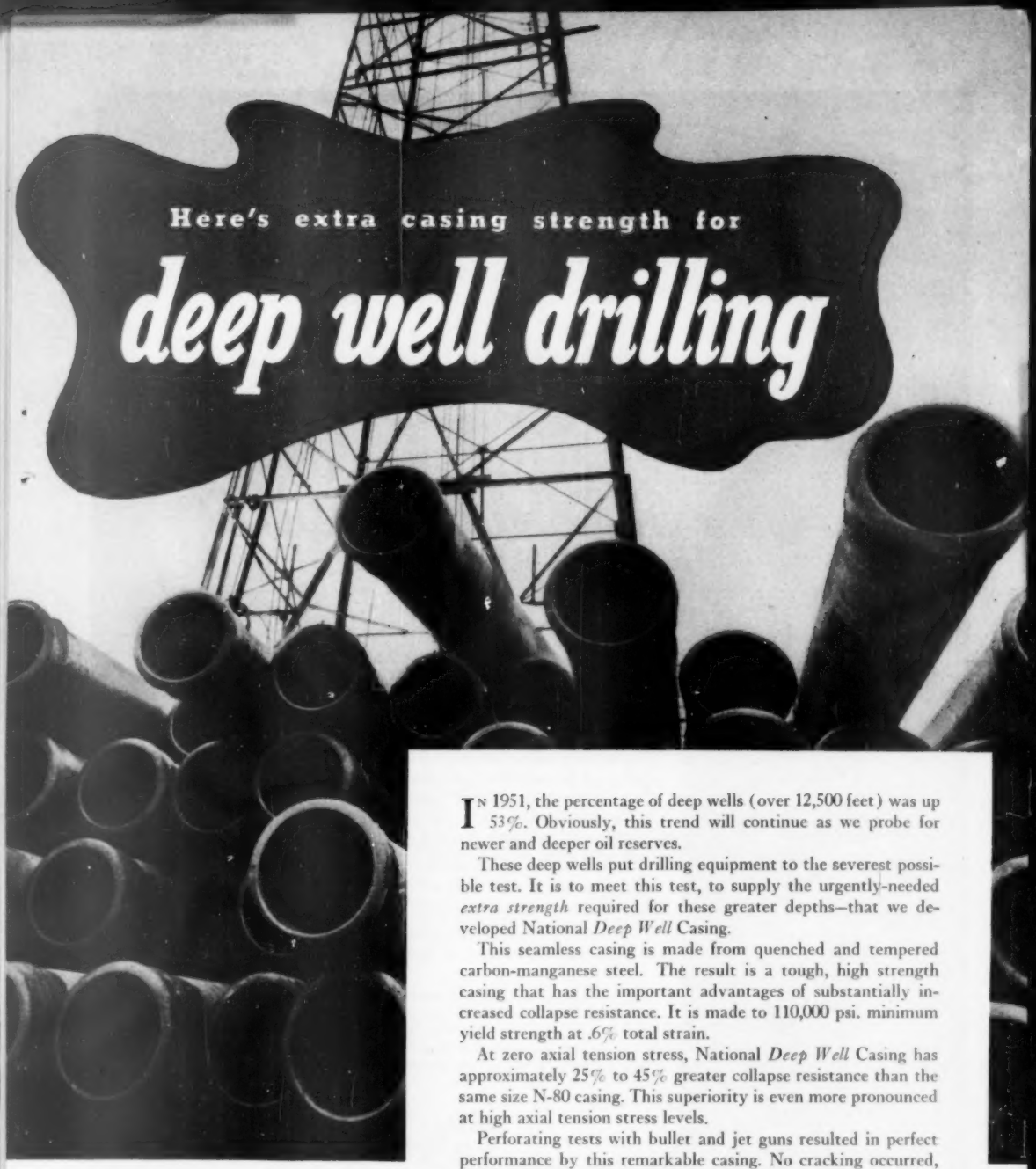
R M PACKINGS

RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Crawfordsville, Ind.; Passaic, N.J.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Asbestos Textiles • Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Sintered Metal Products • Bowling Balls



Here's extra casing strength for

deep well drilling

IN 1951, the percentage of deep wells (over 12,500 feet) was up 53%. Obviously, this trend will continue as we probe for newer and deeper oil reserves.

These deep wells put drilling equipment to the severest possible test. It is to meet this test, to supply the urgently-needed *extra strength* required for these greater depths—that we developed National *Deep Well* Casing.

This seamless casing is made from quenched and tempered carbon-manganese steel. The result is a tough, high strength casing that has the important advantages of substantially increased collapse resistance. It is made to 110,000 psi. minimum yield strength at .6% total strain.

At zero axial tension stress, National *Deep Well* Casing has approximately 25% to 45% greater collapse resistance than the same size N-80 casing. This superiority is even more pronounced at high axial tension stress levels.

Perforating tests with bullet and jet guns resulted in perfect performance by this remarkable casing. No cracking occurred, even though the shots were very close together.

Write today, and we'll send you more information on National *Deep Well* Casing.

All National Deep Well Casing is actually pierced from solid billets of high quality steel—the one manufacturing method that assures absolutely uniform wall strength.

WALLS WITHOUT WELDS

NATIONAL TUBE DIVISION

UNITED STATES STEEL COMPANY, PITTSBURGH, PA.

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

UNITED STATES STEEL

Here's the hookup
for valve-killing
corrosive services...

Stainless Steel
PLUS
Jenkins Quality

To end high valve mortality from corrosive liquids, and to control fluids that must be kept free from contamination or discoloration, stainless steel is the right metal. But it takes more than metal to make a valve. For dependable performance, you need the two-way hookup—Stainless Steel *and* Jenkins time-proved Valve Engineering.

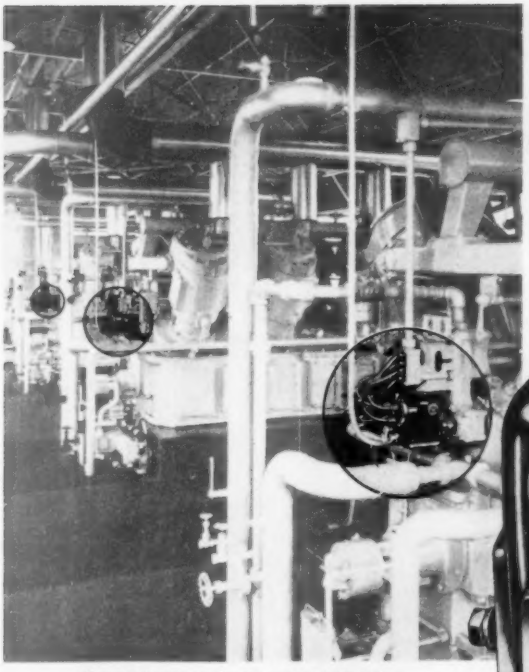
With the increased demand for processing equipment that resists corrosion, more and more Stainless Steel Valves have been added to the Jenkins line. It now includes types and sizes to meet most industrial needs.

Look for the famous Diamond trade-mark on valves of stainless steel. As on *any* Jenkins Valve, it means extra years of trouble-free service.

Send for this folder, Form 194, describing the complete line of Jenkins Stainless Steel Valves. It contains specifications and other important data that will help you select the *right* valves for your plant. Jenkins Bros., 100 Park Ave., New York 17, Jenkins Bros., Ltd., Montreal.

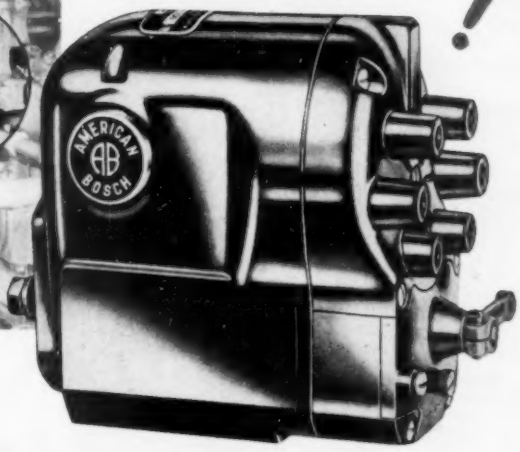
JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE



Shown above, an American Bosch High Tension Magneto installation at the Sun Ray Oil Company's re-cycling plant, Benton, La.

KEEPING HORSEPOWER HUMMING in the OIL INDUSTRY!

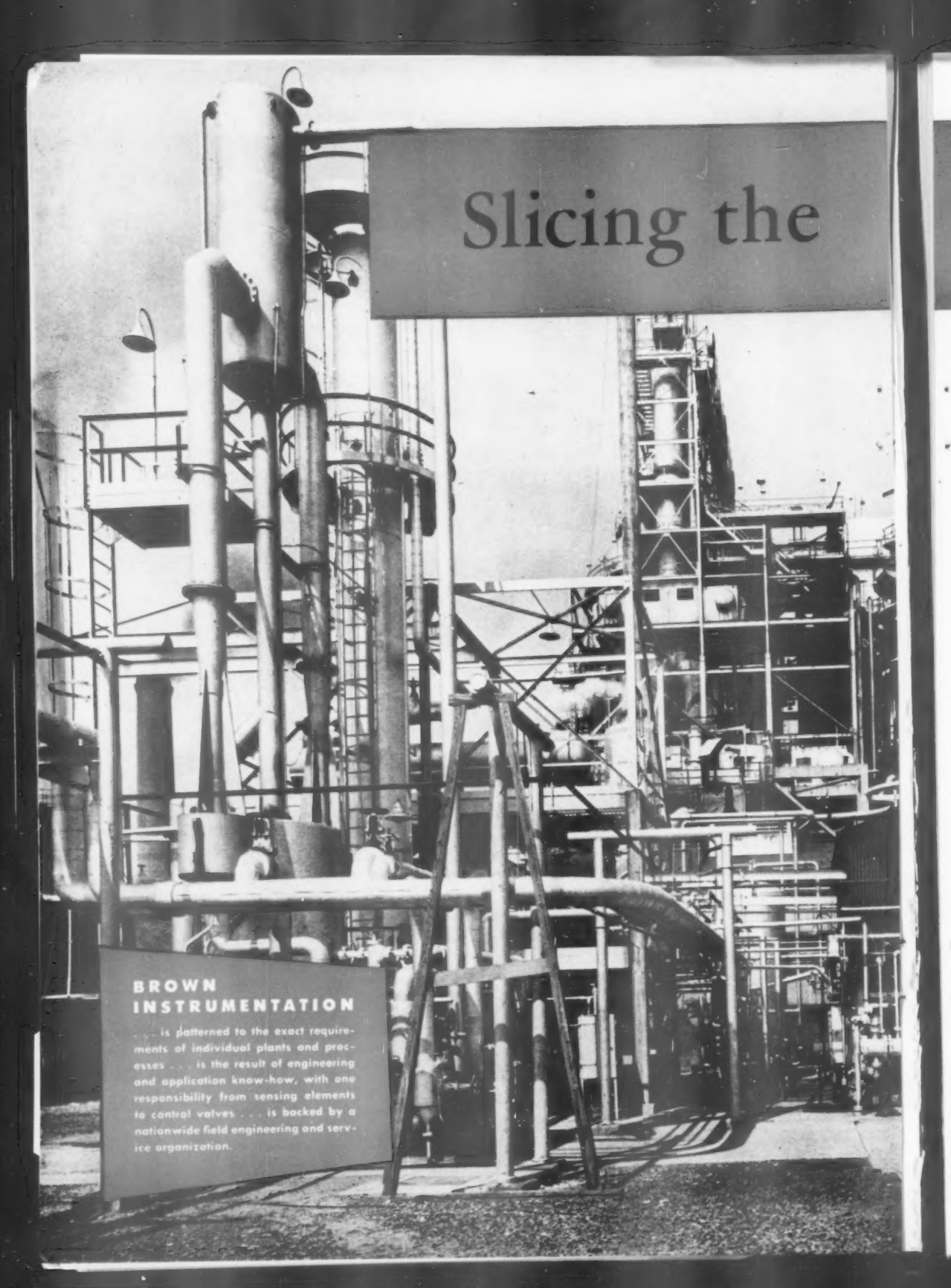


AMERICAN BOSCH MAGNETOS

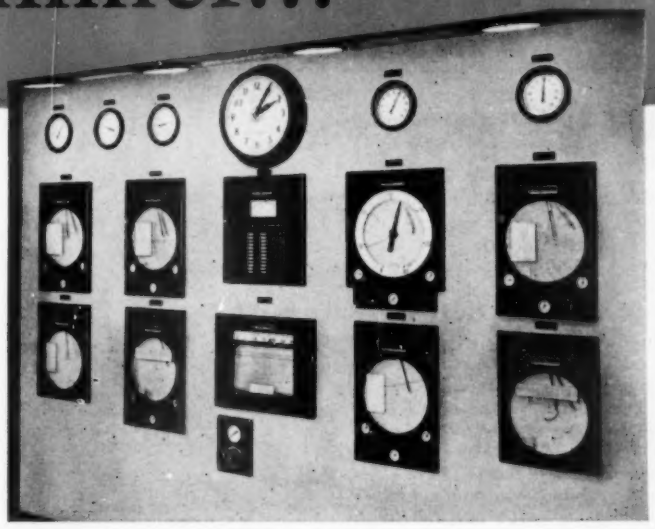
American Bosch Super Powered Magnetos give engines the constant, faultless sparks that assure quick starting and prevent costly ignition tie-ups in profit-producing Oil Industry equipment. Add to these advantages, more *years* of trouble-free ignition in the toughest, continuous operation, and you'll appreciate why these famous Magnetos are used widely, not alone as replacements throughout the Oil Industry, but the choice of many leading manufacturers as original equipment on engines in drilling, producing, pipeline and refinery services.

You can have this maximum spark efficiency and matchless dependability on all your present, spark-ignited engines with either high or low tension ignition systems. For, American Bosch's outstanding electrical and mechanical features are inherent in both high and low tension applications of these power-packed Magnetos. Moreover, there's a generous trade-in allowance on the old magnetos you replace . . . Ask for the cost-reducing, profit-protecting facts and the name of your nearby Distributor. American Bosch Corporation, Springfield 7, Mass.

AMERICAN BOSCH


Slicing the
BROWN INSTRUMENTATION
. . . is patterned to the exact requirements of individual plants and processes . . . is the result of engineering and application know-how, with one responsibility from sensing elements to control valves . . . is backed by a nationwide field engineering and service organization.

cuts thinner...



Deethanizing unit for fractionation of liquefied petroleum gas at Sinclair Refining Co. is regulated by Brown Instruments (at right) on factory-assembled panelboard.

with the help of
Brown Advanced Instrumentation

ACCURATE, coordinated control of fractionation is proving the key to economical separation and purification of chemicals, and to the efficient recovery of light ends of petroleum for conversion to liquid petroleum gas and petrochemicals.

Typical of modern fractionation is the LPG plant of the Sinclair Refining Company at Marcus Hook, Pa. Here as in thousands of operations throughout the world, Brown Instruments measure, record and control every variable critical to process efficiency . . . holding each in line with the precision essential to top output and quality.

When you're looking for automatic recording and controlling instruments for your fractionating operation, or *any other process, consider first:*

- The Brown know-how developed through many years of application experience in the industry.
- The completeness of the Brown line—recorders, controllers, panelboards, valves and accessories.

For a detailed discussion of your process requirements, call in our local engineering representative . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4488 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

● *Important Reference Data*

Write for Composite Catalog No. 5000 describing the principal Honeywell instruments for process industries.

Save-two ways!

with

WAUKESHA DIESEL - GAS CONVERSION KITS

SAVE Use the most economical fuel for your working location **SAVE** Buy double value in ONE engine

Conversion Kits are available for the three biggest Waukesha *Diesel* Oil Field Engines or Power Units—Models 6-WAKD (1197 cu. in.), 6-NKD (1905 cu. in.), and 6-LRD (2894 cu. in.).

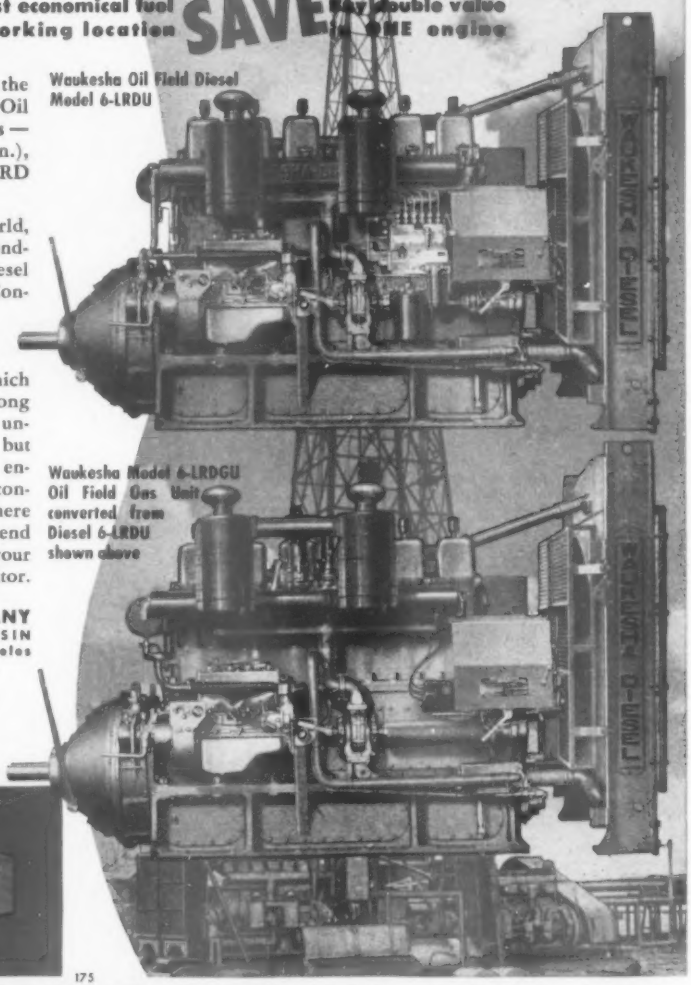
In the oil fields of the world, Waukesha is a by-word for dependable full-rated power on gas or Diesel fuels. The Waukesha-engineered Conversion Kit gives you the advantages of two of these real oil field engines—neither of them a compromise! All the basic features which contribute to the ruggedness and long life of the Waukesha Diesel are unchanged in the gas conversion, but the converted engine is a true gas engine with the special features that contribute to power and efficiency where gas is the most economical fuel. Send for descriptive bulletins or call your Waukesha Oil Field Distributor.

WAUKESHA MOTOR COMPANY
WAUKESHA WISCONSIN
New York • Tulsa • Los Angeles

Conversion Kits contain special cylinder heads for gas fuel, top cylinder oilers, a complete gas fuel system, complete ignition system, and accessories.

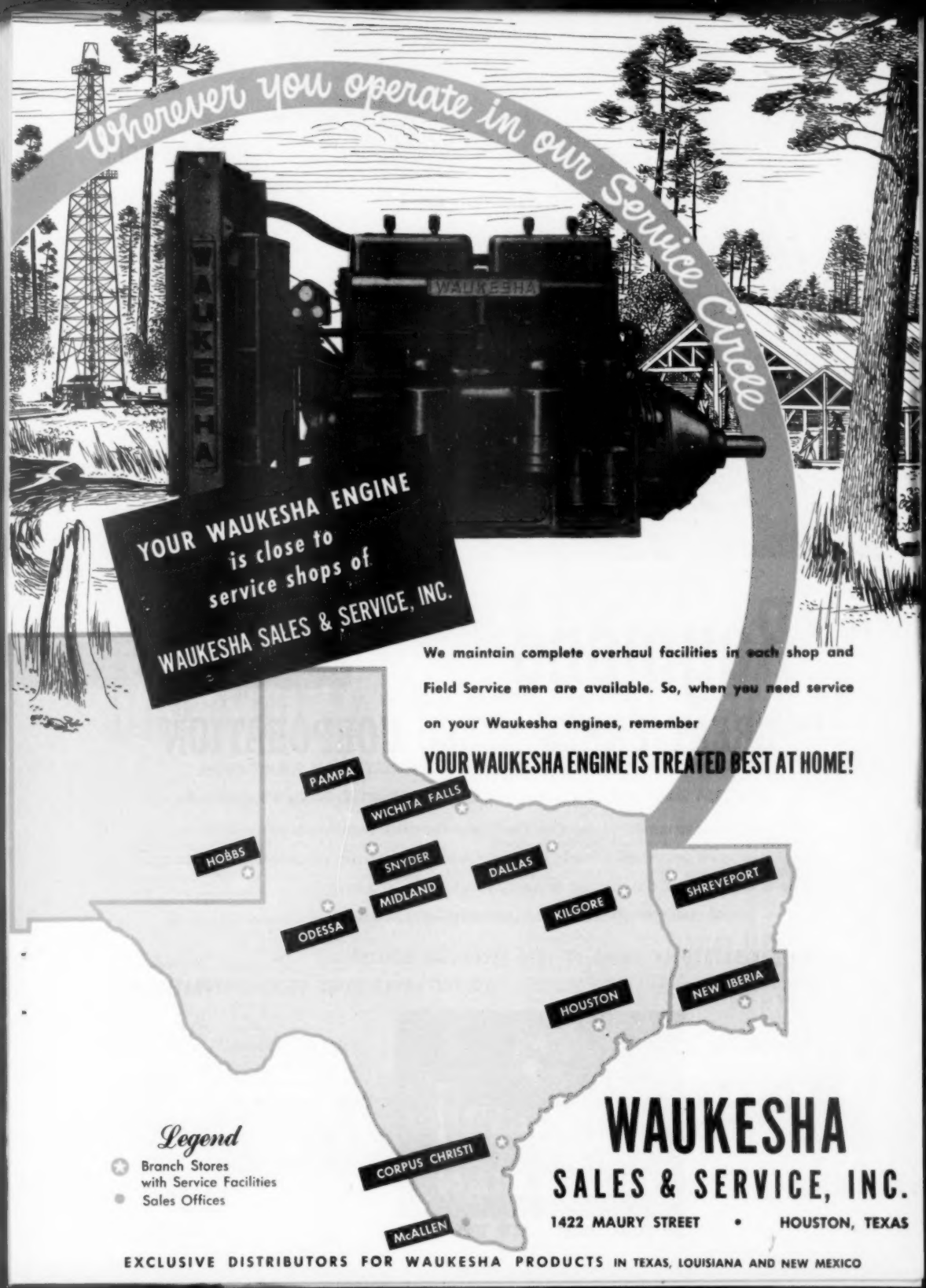
Waukesha Oil Field Diesel Model 6-LRDU

Waukesha Model 6-LRDGU Oil Field Gas Unit converted from Diesel 6-LRDU shown above



175

WAUKESHA OIL FIELD POWER


Wherever you operate in our Service Circle
WAUKESHA
YOUR WAUKESHA ENGINE
is close to
service shops of
WAUKESHA SALES & SERVICE, INC.
We maintain complete overhaul facilities in each shop and
Field Service men are available. So, when you need service
on your Waukesha engines, remember
YOUR WAUKESHA ENGINE IS TREATED BEST AT HOME!
PAMPA
WICHITA FALLS
HOBBS
SNYDER
DALLAS
SHREVEPORT
MIDLAND
KILGORE
ODESSA
HOUSTON
NEW IBERIA
CORPUS CHRISTI
McALLEN
Legend
Branch Stores
with Service Facilities
Sales Offices
WAUKESHA
SALES & SERVICE, INC.
1422 MAURY STREET • HOUSTON, TEXAS
EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, LOUISIANA AND NEW MEXICO

ORE DOCK

GREAT LAKES STEEL CORPORATION

ZUG ISLAND MICHIGAN

FIFTY Raymond CONTRACTS

FOR GREAT LAKES STEEL CORPORATION

DIVISION OF NATIONAL STEEL CORPORATION

The construction of the Ore Dock was the 50th contract between Great Lakes Steel Corporation and Raymond Concrete Pile Company. The work involved the placing of approximately 36,000 cu. yds. of concrete on 7100 long pipe step-taper piles.

WE ARE EXTREMELY PROUD OF THIS RECORD OF SERVICE TO THE GREAT LAKES STEEL CORPORATION

BRANCH OFFICES in the principal cities of the United States and Central and South America.

Raymond CONCRETE PILE CO.

140 CEDAR STREET • NEW YORK 6, N. Y.

SCOPE OF RAYMOND'S ACTIVITIES
Soil investigations, pile and caisson foundations, underpinning, harbor and river improvements and the lining of steel and concrete pipelines by the Centriline process.

One Call for Your Metal Needs!

SAVE TIME AND TROUBLE WITH ONE-CALL BUYING FROM COMPLETE WAREHOUSE STOCKS OF ALL AVAILABLE METALS

Give yourself and your company the full benefit and big convenience of *"one-stop"* buying of metals from Metal Goods Corporation. You'll simplify metals purchasing a lot by calling on our nearest representative. You can rely on us to supply your requirements correctly, completely and quickly. We maintain seven well stocked warehouses and eleven sales service offices to serve your needs. Many metals users are making very profitable use of Metal Goods Corporation service. May we help you?

Please call, wire, or write the following Metal Goods Corporation representative nearest you.

OFFICES AND WAREHOUSES

St. Louis 15, Missouri
5239 Brown Avenue
Nelron L. Hower
Phone: GOodfellow 1234

Kansas City 16, Mo.
1300 Burlington
Frank D. Hogan
Phone: NOrclay 3516

Tulsa 3, Oklahoma
302 North Boston
Scott J. Harrison
Phone: 4-1175

Houston 3, Texas
711 Milby Street
Harris T. Gregg
Phone: CEntral 8881

Denver 2, Colorado
2425 Walnut Street
Neal Dehn
Phone: AComa 5891

Dallas 9, Texas
6211 Cedar Springs Rd.
Sam D. Hodgdon
Phone: ELmhurst 3271

New Orleans 12, La.
432 Julia Street
Carl T. Wedemeyer
Phone: CAnal 7373

SALES SERVICE OFFICES

Wichita, Kansas
2200 East Central
Ray Noller
Phone: 7-8921

Jackson, Mississippi
781 Raymond Road
George E. Akerberg
Phone: 5-2711

Decatur, Illinois
1305 West Sunset
Arlie W. Tempel
Phone: 8-1314

Baton Rouge, Louisiana
4419 Mimosa Street
Paul P. Vidovic
Phone: 4-4738

Indianapolis 2, Ind.
1333 N. Pennsylvania
Harry L. Newton
Phone: Lincoln 4980

Memphis, Tennessee
713 Columbian Mutal Tower Bldg.
Robert W. Downs
Phone: 5-8721

Omaha, Nebraska
3515 No. 67th Avenue
C. M. Cooley
Phone: Walnut 1112

Beaumont, Texas
238 Bowie Bldg.
Lee T. Dodson
Phone: 4-7536, 4-7537

Fort Worth, Texas
3821 Carolyn
John M. Turbitt
Phone: FOrtune 4369

San Antonio, Texas
2012 Alamo Natl. Bldg.
Roy D. Bagaley
Phone: GArfield 3161

Davenport, Iowa
924 State Street
Robert L. Tharp
Phone: 2-3156

METAL GOODS CORPORATION

GENERAL OFFICES: ST. LOUIS 15, MISSOURI

Over One Hundred Years of Engineering Leadership

JOY
MOTORIZED DRILL RIGS

Most ADVANCED in Design — Most EFFICIENT in Operation!

Available in a range of heavy-duty models for exploration drilling, seismograph, water well, electrical logging or slim-hole production drilling to 5000′. JOY Drill Rigs incorporate many exclusive features you'll like, because they're built by practical engineers—men who know oil-field drilling from the grass roots down. ● For speed, endurance, mobility and economy, your best bet is a JOY rig—built by the world's oldest and largest producer of core drills and motorized drill rigs.

Write for Bulletin, or

Consult a Joy Engineer

WBD O 3002

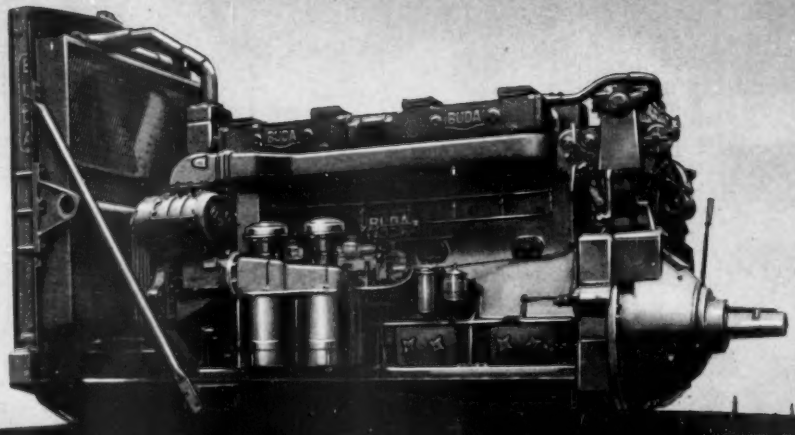
JOY MANUFACTURING COMPANY

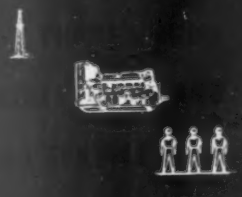
GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

OVERSHADOWS THEM ALL-

BUDA "2505" OILFIELD ENGINES





BUDA

They did what you can do to produce more

How to get high power dependability without paying for standby capacity

When Sohio modernized and expanded the Lima refinery they needed a highly dependable power system. But they didn't want to pay for emergency stand-by capacity, a common way to achieve reliability. So engineers from Sohio, Dingle-Clark Co., and Westinghouse worked out an ingenious solution based on a sound basic principle.

Ingenious Controls Instead of Transformers

The basic principle is this: that you don't need *absolutely continuous power* for high reliability, but rather *speedy restoration of service* after disturbances do occur. So instead of providing for expensive extra transformer capacity, they developed a control system that automatically and rapidly clears trouble. And a power loss up to four seconds doesn't slow down the plant.

Devastating Tornado Didn't Stop Operation

The results of this sound planning were soon evident. Nine months after installation, a devastating tornado hit Lima and knocked out one of the two power lines serving the plant. The two key motors (catalytic cracker blower drive) were thrown out of synchronization. But both were immediately restarted by the ingenious control system. Then a second fault knocked them out again and one motor restarted to keep the process going all through the disturbances.

Disturbances are Cleared Automatically

In the first nine months of operation, there were 12 disturbances which affected these key blower motors. On ten occasions, the controls automatically restarted the motors. The other two times, the motors were restarted manually. Numerous other disturbances have failed to affect plant operation in *any* way.

Call Westinghouse Early On Your Next Project

The key to continuous power is good planning. Westinghouse would like to do this kind of planning with you. Call us in *early* when *you* build, expand or modernize. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Penna.

HOW SOHIO GOT HIGH RELIABILITY AT LOW COST

To keep the costs down, they built very little spare capacity into the system. Thus if there is a momentary outage, the load must be reapplied in segments. The operation is controlled by Westinghouse high-voltage switchgear, shown at left.

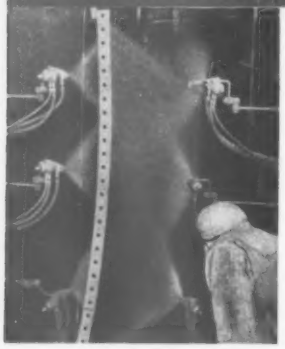
The big power users are the blower motors. If power outage occurs, they're automatically taken off the line by a clever "under-frequency" relay so that the rest of the plant can start up when the fault is cleared. Then in less than one minute, one of the blower motors restarts automatically. The plant keeps operating through the disturbance.

J-94906

YOU CAN BE SURE...IF IT'S
Westinghouse
EQUIPMENT FOR THE PETROLEUM INDUSTRY

Your Best Long-Term Buy Is Butler

BOLTED STEEL OIL TANKS • WALKWAYS AND STAIRWAYS



Each tank gets better, more uniform surface protection because of Butler electrostatic paint spray equipment. This 2-coat bond helps resist corrosion, adds longer life to the tank.

Butler Bolted Tanks . . . Walkways and Stairways . . . are your best long-term buy because the extra care and skill that Butler puts into engineering and fabrication give you extra years of service.

Each Butler tank sheet is die formed and all parts are precision made and punched for an oil-tight fit and easier erection. A.P.I. specifications on all tanks from 100 to 10,000 barrel capacities.

Remember that Butler is your best long-term buy. See your Butler Distributor.

You'll Always Get Dependable Service from Your Butler Distributor

Your Butler distributor will give you dependable service on Butler Bolted Steel Tanks, Walkways and Stairways, Unit Heaters and other oil field equipment.

AMERICAN PIPE & SUPPLY COMPANY

Casper, Wyoming — Denver, Colorado — Cut Bank, Montana

HARRY G. MILLER

El Dorado, Arkansas

UNION TANK & SUPPLY COMPANY

Fort Worth, Texas	Alice, Texas	Abilene, Texas	Great Bend, Kansas
Houston, Texas	Tyler, Texas	LaFayette, La.	Tulsa, Okla.
Odessa, Texas	Midland, Texas	Ruston, La.	Oklahoma City, Okla.
Snyder, Texas	Nocona, Texas	New Orleans, La.	Hobbs, New Mexico

W. H. CONNOR, INC.

Denver, Colorado — Sterling, Colorado — Casper, Wyoming — Powell, Wyoming

BUTLER STEEL PRODUCTS

BUTLER MANUFACTURING COMPANY

KANSAS CITY, MO.

Galesburg, Ill. — Richmond, Calif. — Birmingham, Ala. — Minneapolis, Minn.

What it takes to make steam behave *at 1450 psi and 1000° F!*

MAIN STEAM PIPING INSTALLED AT SALEM HARBOR STATION OF NEW ENGLAND POWER COMPANY

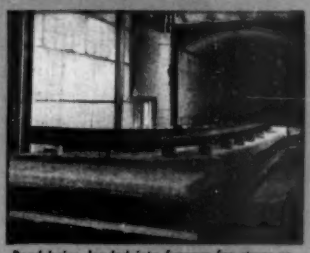
Manufacture of this main steam piping began at Pennsylvania Forge Corporation as 20-ton alloy-steel ingots (2½% chrome, 1% moly steel). Four days' forging changed the ingots into solid bars 30 ft. long, with outside diameter of 15½ in. Boring, turning, sizing and finishing followed.

FABRICATION of the main steam line for the Salem Harbor Station of the New England Power Company, vital link in more than 52 miles of piping fabricated by Grinnell, is an example of the *many* skills required of Grinnell piping specialists. Grinnell chemists, metallurgists, physicists, radiologists and supersonic electronic scientists . . . *all* played a part in the bending, welding and testing operations.

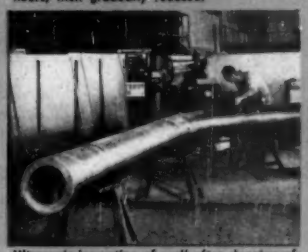
The integration of complex, highly technical skills like these into a *single* organization of trained specialists explains Grinnell's leadership in the field of prefabrication. It explains, too, why your interests are best served when you call upon Grinnell's expert personnel and specialized facilities in the solution of your piping problems.

Bending furnace raises pipe temperature to 2000°F in 3 hours, 40 minutes. Thermocouples and pyrometer measure pipe temperature.

Skilled team completes bend in six minutes. Inside surface temperature dropped about 100°F.



Bend being loaded into furnace for stress relieving. Heat maintained at 1425°F for 4½ hours, then gradually reduced.



Ultrasonic inspection of wall after cleaning of pipe shows maximum thinning in bend of 1/16 inch.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

FIGHTING HEART

...of all this equipment!

Chrysler Industrial 15 — one of eight basic models.

CHRYSLER-BUILT INDUSTRIAL ENGINES ARE THE SOURCE OF POWER FOR:

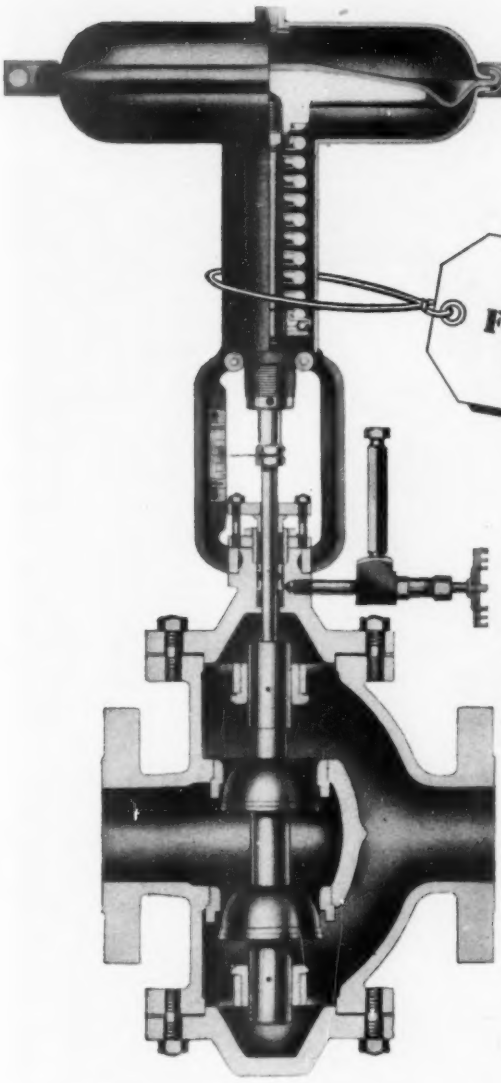
- Ditching Machines
- Cranes
- Truck Mixers
- Shovels
- Loaders
- Yarders
- Concrete Mixers
- Road Pavers
- Crane Carriers
- Scoop Tractors
- Air Compressors
- Hoists
- Derricks
- Pumps
- Generators
- Conveyors
- Tackle Blocks
- Winches
- Tractors
- Combines
- Gang Mowers
- Spreaders
- Irrigation Equipment
- Orchard Sprayers
- Hay Choppers
- Pumps
- Feed Mills
- Sprinklers
- Locomotives
- Motor Coaches
- Drilling Equipment
- Air Conditioning Equipment
- Pulp Machines
- Fire Pumps
- Street Flushers
- Snow Plows
- Oil Well Pumps and Drillers

Original equipment manufacturers the nation over install Chrysler Industrial Engines in their equipment because Chrysler-built means better performance . . . rugged dependability . . . trouble-free operation . . . longer operating life, service everywhere.

Continuous Chrysler research in higher alloy steels and famed Chrysler engineering have produced an industrial engine capable of sustained high speeds with less wear . . . an engine that costs less to operate, less to maintain.

A letter of inquiry will bring you a qualified Chrysler engineer. Address: **Industrial Engine Division, Chrysler Corporation, Detroit 31, Michigan.**

CHRYSLER
Industrial Engines



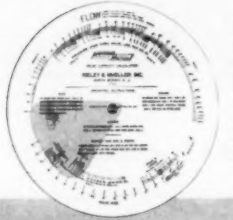
AMERICA'S LEADING INDUSTRIES PUT THE STAMP OF APPROVAL ON KIELEY & MUELLER CONTROL VALVES

Make It Your Business to Find Out Why!

All over the country leading companies in the process industries are solving tough problems with K & M control valves, designed especially for precise and positive control by instrumentation.

More and more, as the outstanding performance of these superbly engineered valves becomes known, important companies with pressure and flow applications are turning to K & M for the skill, knowledge and experience that assure reliable automatic control of pressures, temperatures, rates of flow and liquid levels.

There is a qualified K & M representative near you, eager to discuss your control problems and able to provide the most satisfactory solution.



This extremely accurate circular slide-rule type K&M valve capacity calculator includes correction scales for steam quality, liquid and gas specific gravity and a flowing temperature scale for gases. Sent without charge in response to a request on your business stationery.

K&M

KIELEY & MUELLER, INC.

Valve Makers Since 1879

2033 - 43rd STREET NORTH BERGEN, N. J.

These tubes have service "built in"

CHASE ANTIMONIAL ADMIRALTY

(a patented alloy)

Since 1935, millions of pounds of Chase Antimonial Admiralty* tubes have been installed and are serving well. This testifies that they'll give you years of service, too.

These tubes resist dezincification because they have *enough* antimony. And because antimony doesn't affect grain structure, it will not weaken the tube.

Chase Antimonial Admiralty* stays tough . . . stands up under heavy duty. Send coupon for FREE book on Condenser and Heat Exchanger Tubes.

CHASE WAREHOUSE STOCKS:
NEW YORK, BALTIMORE, NEW ORLEANS, LOS ANGELES, also carried by —
Vinson Supply Co., Tulsa
Standard Brass & Mfg. Co., Houston.

*U.S. Pat. No. 2,061,921

FREE CHASE BOOK discusses corrosion problems and selection of proper alloy for condenser and heat exchanger tubes.

Chase Brass & Copper Co., Dept. OGJ 752
Waterbury 20, Conn.

Please send me Free Book on Condenser and Heat Exchanger Tubes.

Name_____

Position_____

Firm_____

Street_____

City_____ **State**_____

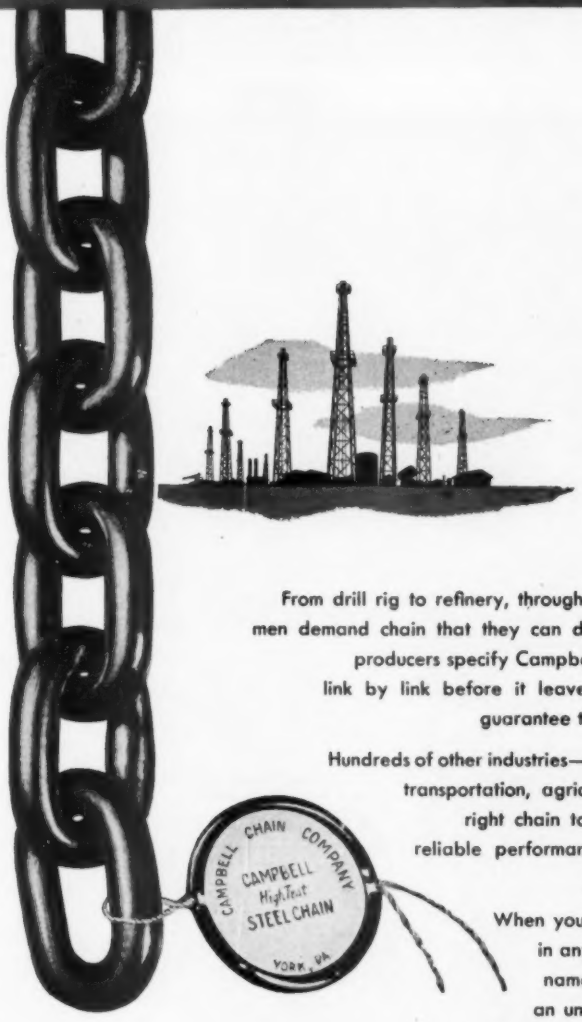
Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• The Nation's Headquarters for Brass & Copper

Albany†	Cleveland	Kansas City, Mo	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

Oil men never take chain for granted!



From drill rig to refinery, through production and transportation, oil men demand chain that they can depend on. That's why leading oil producers specify Campbell Chain . . . chain that is inspected link by link before it leaves the factory. This is Campbell's guarantee that the chain is safe and sure.

Hundreds of other industries—among them mining, manufacturing, transportation, agriculture—look to Campbell for the right chain to fit their specific needs. Years of reliable performance have proved the long-lasting dependability of Campbell Chain.

When you need chain, for any purpose . . . in any grade, be sure to order it by the name—Campbell. Or, when you have an unusual problem involving chain, call the Campbell representative in your area. Take advantage of his experience.

Chain for every need . . . INDUSTRIAL . . . MARINE . . . FARM . . . AUTOMOTIVE

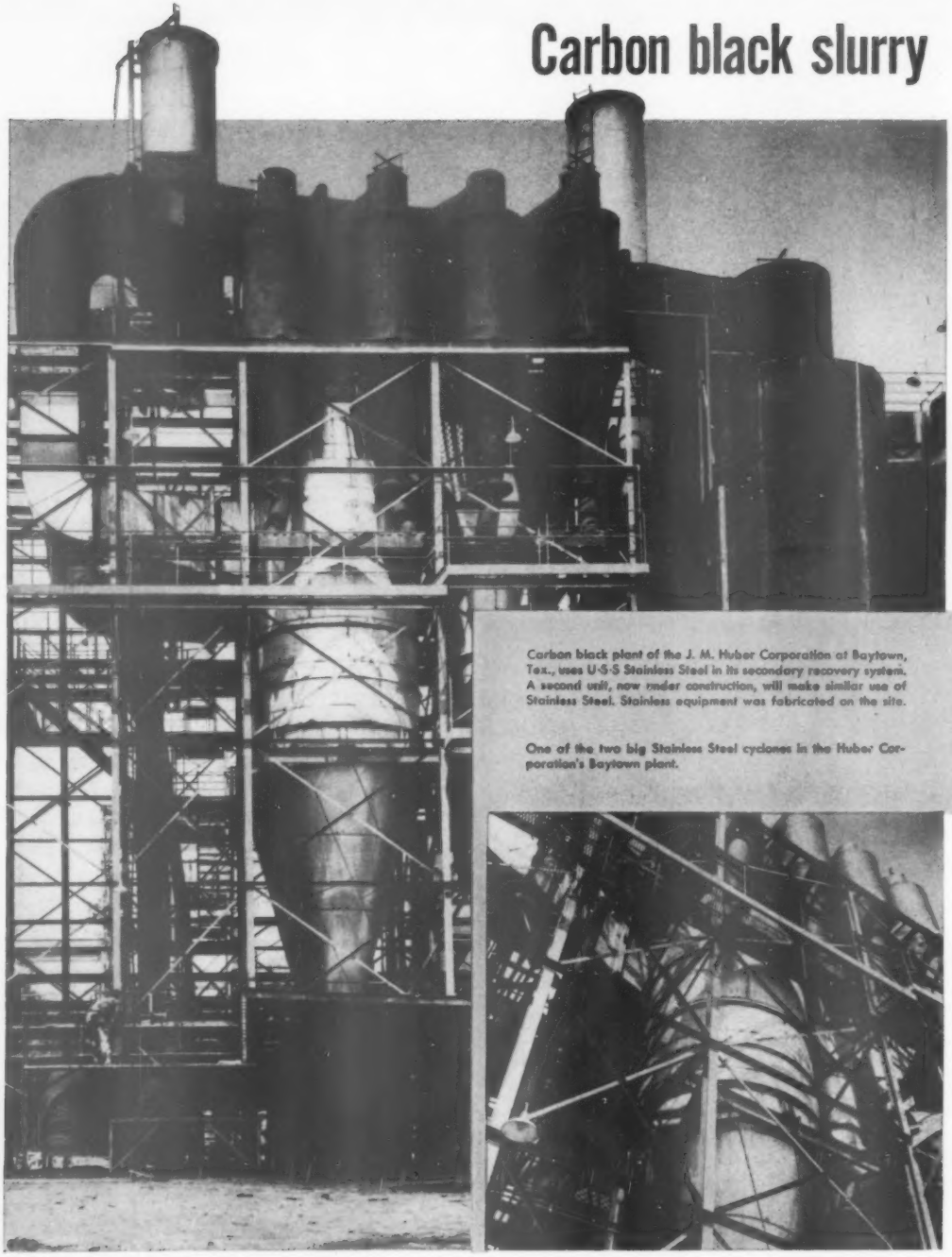
CAMPBELL CHAIN *Company*

MAIN OFFICE—YORK, PA. • *Factories*—York, Pa., and West Burlington, Iowa

CAMPBELL CHAIN

MAKERS OF FAMOUS CAMPBELL LUG-REINFORCED TIRE CHAINS

Carbon black slurry



Carbon black plant of the J. M. Huber Corporation at Baytown, Tex., uses U-S-S Stainless Steel in its secondary recovery system. A second unit, now under construction, will make similar use of Stainless Steel. Stainless equipment was fabricated on the site.

One of the two big Stainless Steel cyclones in the Huber Corporation's Baytown plant.

After only three weeks in service, the non-Stainless portion of this piping has been completely ruined by corrosive carbon black slurry, while the Stainless Steel section remains in good condition.

gives equipment the acid test ... and only Stainless Steel survives!

ONE GLANCE at this section of piping tells you why Stainless Steel was a must for the secondary recovery system in J. M. Huber Corporation's carbon black plant at Baytown, Texas. After only three weeks of service, the non-Stainless portion is completely eaten through, while the part made of Stainless Steel is relatively unaffected by the extreme corrosion.

In order to get maximum recovery of the carbon black produced in converters at this plant, the Huber Corporation installed a secondary recovery system. The secondary system includes dry and wet recovery, and it's in the wet end where corrosion takes its heaviest toll.

The Huber Corporation tested many types of materials, plus many different kinds of coatings, before selecting U·S·S Stainless Steel for wet recovery. Stainless Steel was used for the two cyclones—each 12 feet in diameter and 42 feet high—for the sprays inside the cyclones and the piping through which the corrosive slurry passes.

In this application, U·S·S Stainless Steel is subjected to sulfuric acid, carbonic acid and other acids. Temperatures range up to 180°. Stainless Steel is standing up under these conditions where other materials failed after two or three weeks' service at the most.

The severe service conditions under which chemical processing equipment operates often preclude the use of anything but Stainless Steel. Stainless Steel's resistance to high temperatures and extremely corrosive conditions, its strength with light weight and its freedom from product contamination mean long equipment life with less maintenance and less frequent replacement.

Some grades of Stainless Steel are in limited supply today, but essential needs are being filled. For finest performance, insist that your fabricator use perfected, service-tested U·S·S Stainless Steel.

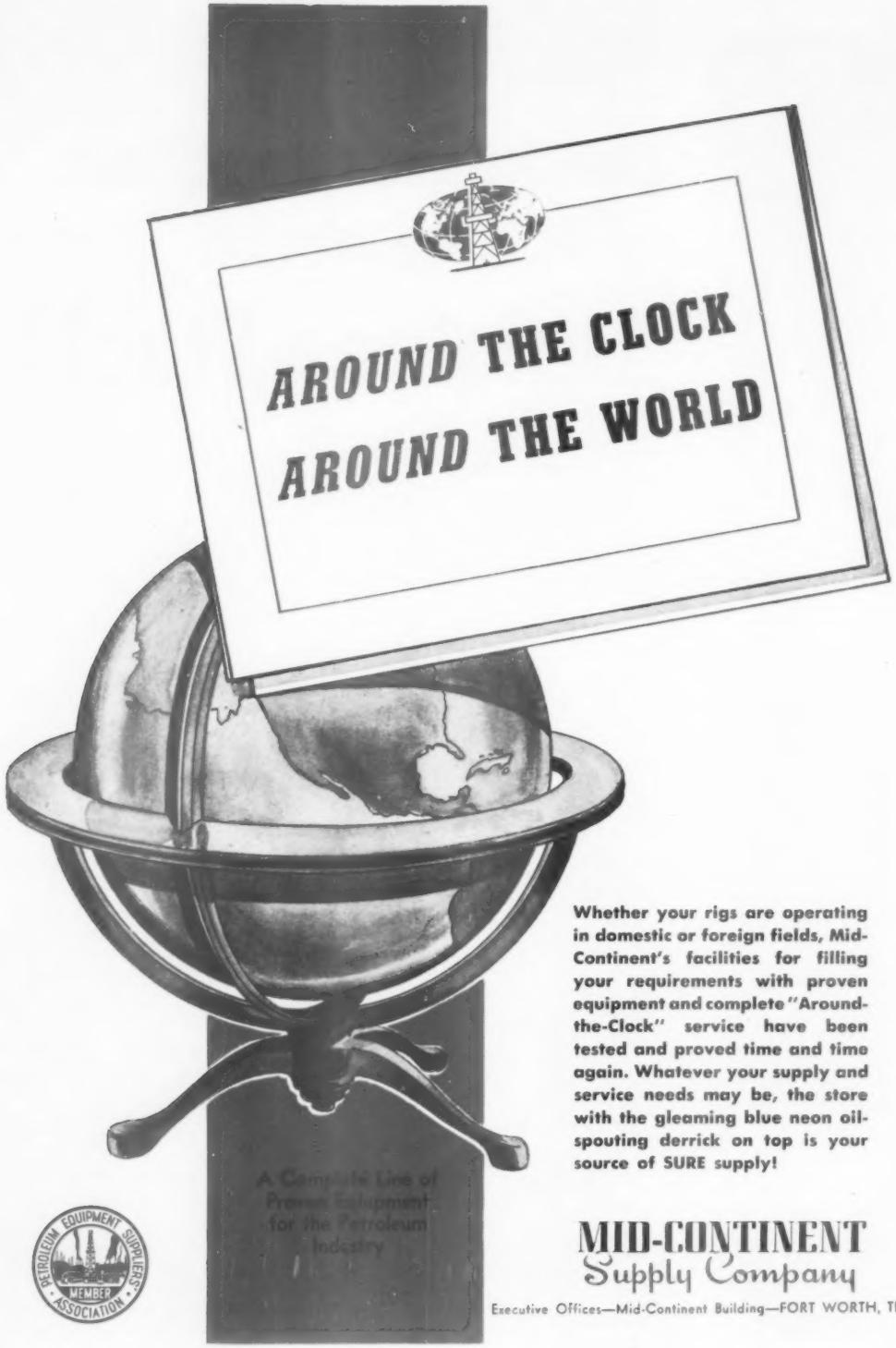
U·S·S STAINLESS STEEL

2-113

USS

UNITED STATES STEEL COMPANY

AMERICAN STEEL & WIRE .... COLUMBIA-GENEVA STEEL .... NATIONAL TUBE .... TENNESSEE COAL & IRON
UNITED STATES STEEL SUPPLY, WAREHOUSE DISTRIBUTORS .... Divisions of UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION
MEMBER

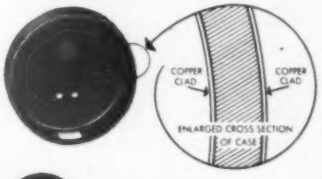
Whether your rigs are operating in domestic or foreign fields, Mid-Continent's facilities for filling your requirements with proven equipment and complete "Around-the-Clock" service have been tested and proved time and time again. Whatever your supply and service needs may be, the store with the gleaming blue neon oil-spouting derrick on top is your source of SURE supply!

MID-CONTINENT
Supply Company

Executive Offices—Mid-Continent Building—FORT WORTH, TEXAS

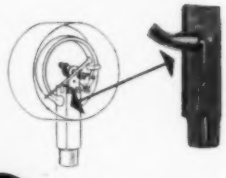
A NEW Xmas Tree Gauge

TAKE A GOOD LOOK at the facts presented below and we believe you'll agree that this is the finest Xmas Tree Gauge ever developed!



1 NEW *Marshalloy* CASE

A brand new conception in gauge housings. It is corrosion resistant, four times as strong and one-third lighter than conventional iron cases. It is made of copper-clad wrought steel of boiler plate thickness. It is much less likely to corrode than iron or steel, but has the strength of heavy-gauge steel. Known as "Marshalloy," it has all the advantages of plastic or die-cast cases, but none of the disadvantages. It can't be broken like a plastic or die-cast case. It won't rust or corrode. It has four times the strength of cast iron, but only two-thirds the weight. Finished in a new corrosion resistant, satin black enamel, and fitted with Marsh safety blow-out plug, it is the finest case you have ever seen.



2 NEW *Conoweld* TUBE

Tube, socket and end-piece "Conowelded" into an integral unit

To insure absolute dependability, a gauge must be made permanently leak-tight from inlet to end-piece of the bourdon tube. This has always presented a tough problem, but here is the final solution. By a special process the tube is "Conowelded" into socket and end-piece to form the equivalent of one-piece construction. The tube is then accurately tempered to required resiliency.

The unretouched photo of a socket sawed in half shows the perfect fusion of the joint at the point where the bourdon tube enters the socket—the joint that is most difficult to make. Photomicrographs are also available to prove the perfection of this process.

3 SUPERLATIVE *Mastergauge* MOVEMENT with coined sector

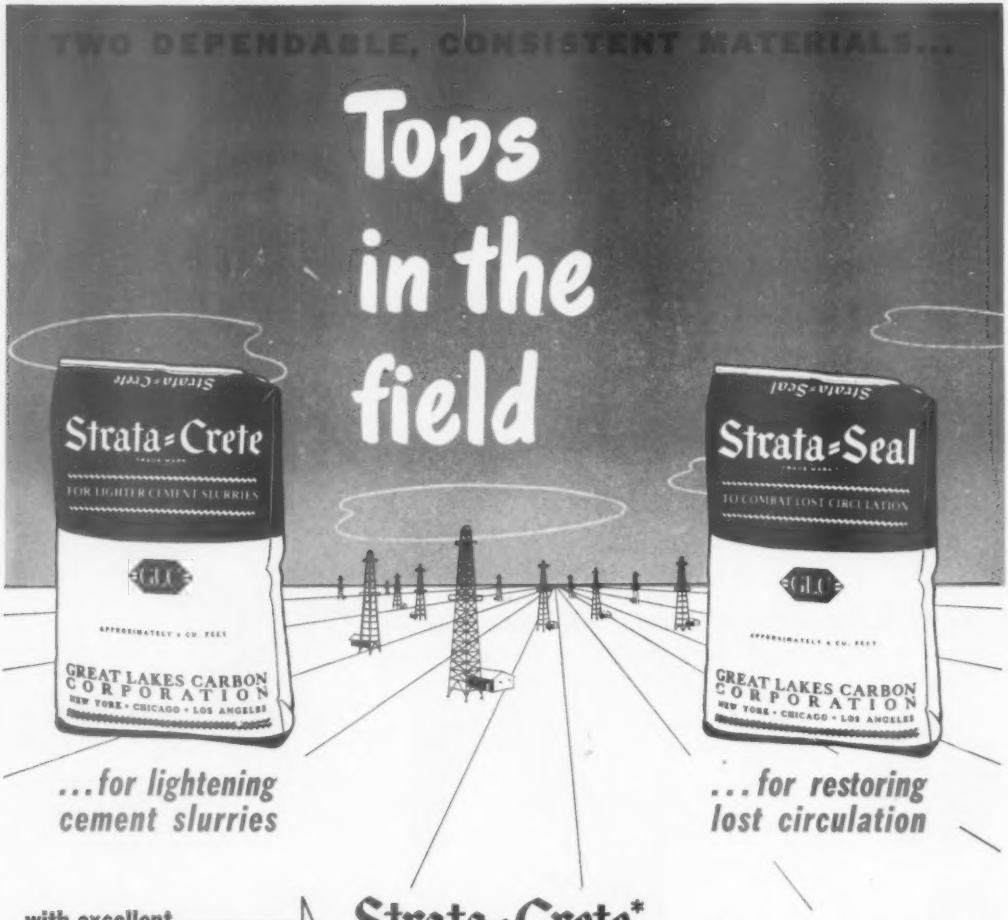
The crowning touch to the Xmas Tree Gauge is the Marsh "Mastergauge" Movement. In tens of thousands of Marsh "Mastergauges" this finer movement has proven its ability to stand the gaff of oil country service better than any other.

Notice the broad pinion gear and coined sector gear surfaces with teeth cut to the highest standards of precision. The coined form (see enlarged section) is a typical Marsh refinement — a form that gives greater strength where greatest strength is needed. Unlike metals, giving a self-lubricating frictionless effect, are used throughout. It is a movement in keeping with the advanced design and construction of this new Gauge.

MARSH INSTRUMENT CO. Sales affiliate of Jas. P. Marsh Corp. **Dept. L, Skokie, Ill.**

Houston Branch Plant **1121 Rothwell St., Houston, Texas**

MARSH GAUGES



with excellent bridging effectiveness...

Strata-Crete* the lightweight, processed perlite aggregate not only permits higher columns at lower pressures ... but also bars loss of cement slurry ... greatly reduces perforation cracking or shattering.

with excellent bridging qualities...

Strata-Seal* has *proved* its superiorities in well after well ... chemically inert, is not affected by mud or heat ... permits screening ... cuts rig downtime ... often saves abandonment.

**Trade Mark GLCC*

GREAT LAKES CORPORATION
a subsidiary of
GREAT LAKES CARBON CORPORATION
5845 Atlantic Ave., Long Beach 5, Calif.
Offices in Principal Oil Centers

Packed in 4 cu. ft. bags.
Available through Leading Oil Well Cementing Concerns; Leading Mud Service Companies.
Write for more data.

Though the transition from bailers and plunger sand pumps, in cable tool operations, to the first major developments in mud engineering for rotary drilling took place over a long period of time, the engineers at National Supply introduced efficient slush pumps almost forty years ago.

Meanwhile, the researchers at Spang-Chalfant were busily engaged in the problems of drilling string performance brought about by big increased demands for greater velocity, larger volume, and variable viscosity of the drilling mud. The introduction of Spang tubular products capable of resistance to corrosion fatigue, and with design characteristics which permit greater volume of mud circulation in smaller diameter pipe, were two of the principal outgrowths of this study.

But the unromantic fluid which has had such a vital role in the expansion of the drilling capacity of modern rotary equipment has been responsible for still other product development programs at National Supply. As a result, improved swivels, more efficient kellys and collars, more durable fluid end parts, as well as constantly improved slush pumps, are still being pioneered by National Supply.

It's this complete coordination of research and product development based on field and laboratory studies of fully integrated equipment which makes it possible for National Supply to furnish everything that's new and everything that's standard for efficient handling of essential and unromantic mud — as well as for every other kind of drilling and production operation.

THE NATIONAL SUPPLY COMPANY

General Sales Offices: Pittsburgh 30, Pa.

Division Offices: Casper; Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance

Canada: The National Supply Company, Limited, 702 Barron Building, 610 Eighth Avenue, West, Calgary, Alberta

Export: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London, E.C. 2

NATIONAL BLUE PRODUCTS

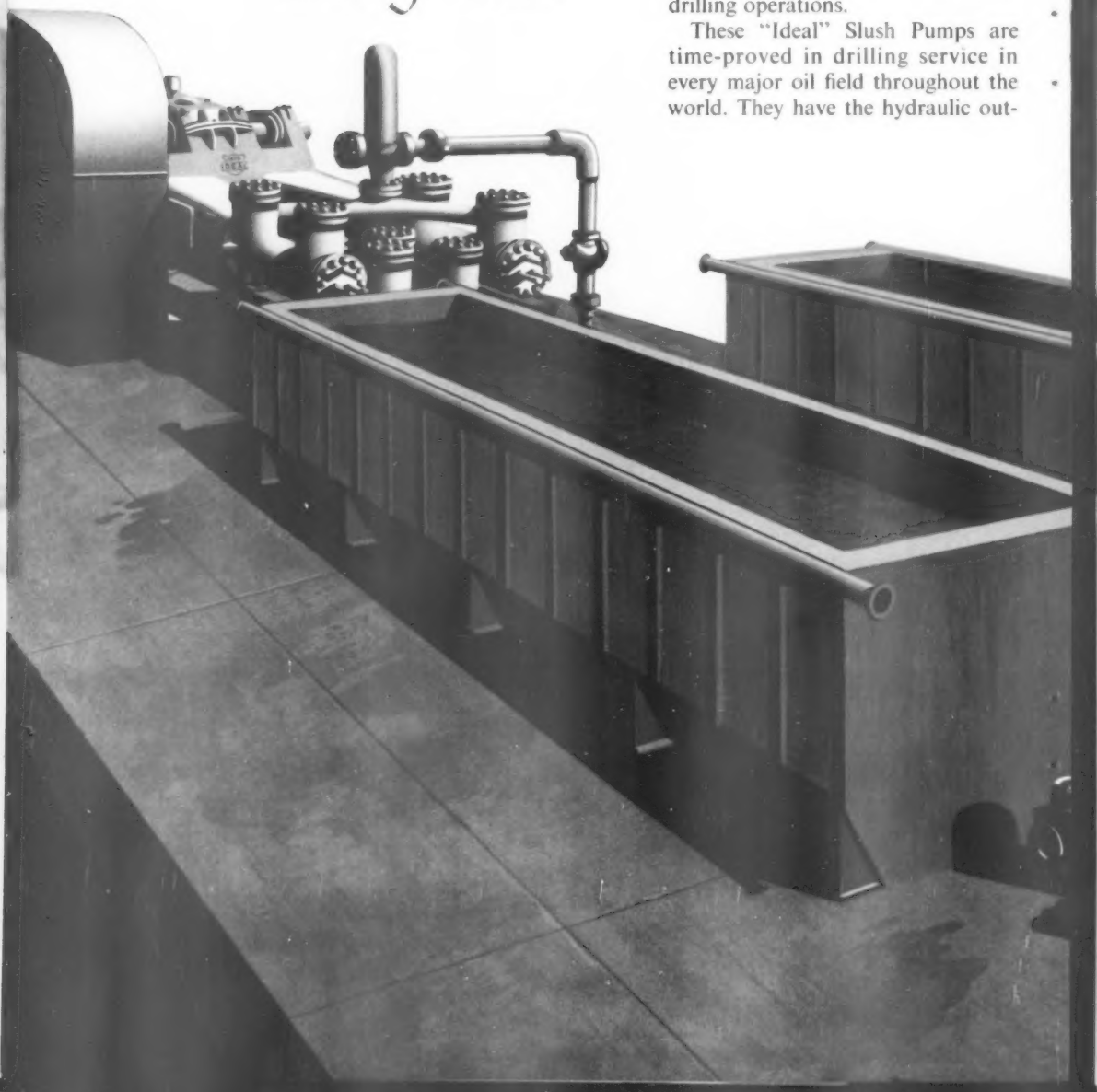
MUD VELOCITY *and* MUD VOLUME

for present-day drilling needs

The growing demand for additional pump capacity—for greater pressures and increased fluid volume, at highly variable viscosities—has been under continuous study by National Supply researchers and by National's field engineers.

As a result, the National catalog contains a complete family of "Ideal" Slush Pumps for every purpose from shallow-well and mud-mixing types right on up to the heavy-duty units which are being used in the deepest drilling operations.

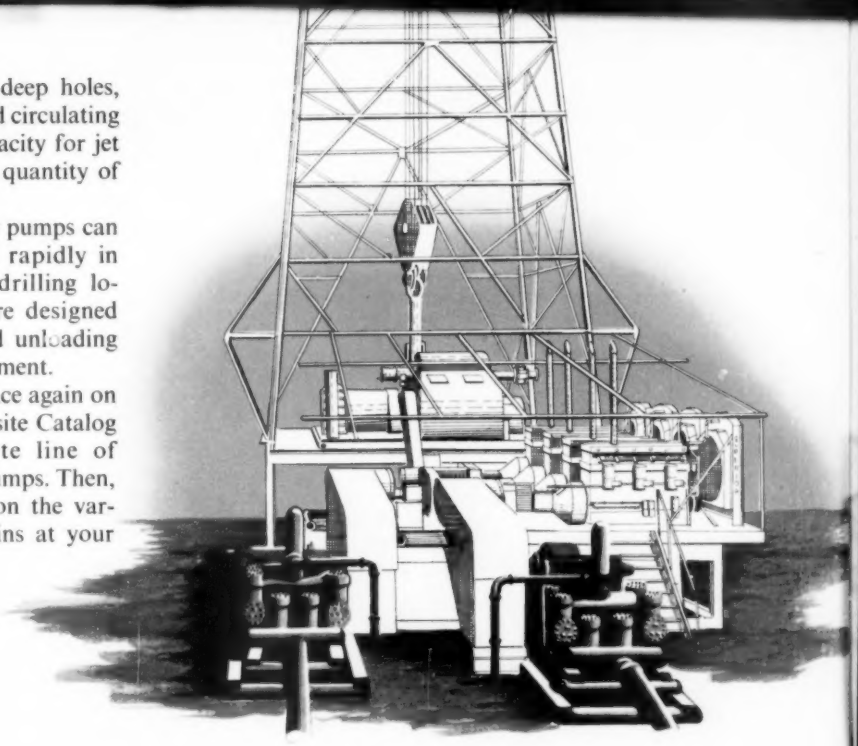
These "Ideal" Slush Pumps are time-proved in drilling service in every major oil field throughout the world. They have the hydraulic out-



put capacity for use in deep holes, and more than ample mud circulating volume and pressure capacity for jet drilling regardless of the quantity of cuttings to be removed.

Of course, these sturdy pumps can be handled readily and rapidly in frequent moves to new drilling locations, because they are designed and built for loading and unloading with the usual field equipment.

It's time to check up once again on the section of the Composite Catalog describing the complete line of National "Ideal" Slush Pumps. Then, for specific information on the various sizes, ask for bulletins at your National Supply Store.



NATIONAL BLUE PRODUCTS

THE NATIONAL SUPPLY COMPANY

General Sales Offices: Pittsburgh 30, Pa.

Division Offices: Casper; Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance

Canada: The National Supply Company, Limited, 702 Barron Building, 610 Eighth Avenue, West, Calgary, Alberta

Export: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London, E.C. 2

for maximum slush pump efficiency

A good preventive maintenance program on slush pumps attains its maximum effectiveness when "Ideal" Fluid End Parts are specified because these parts are the products of National Supply—experienced manufacturer of slush pumps for almost 40 years.

Thus, the continuing research and development program on materials and methods for improving slush pump performance, carried on by National Supply engineers, is reflected in parallel improvement of fluid end parts to obtain maximum mud volume and velocity from each pump.

Of like importance are three additional facts about "Ideal" Fluid End Parts—

- They're carried in stock at every one of more than 100 National Supply Stores in the United States and Canada.
- They're made available in every major oil field throughout the world by the Export Division of National Supply.
- They're designed for use on pumps of other makes, as well as for "Ideal" Slush Pumps.

You'll find it worthwhile to specify "Ideal" Fluid End Parts to maintain maximum slush pump efficiency at minimum cost through effective preventive maintenance.

USE IDEAL

FLUID END PARTS

THE NATIONAL SUPPLY COMPANY

General Sales Offices: Pittsburgh 30, Pa.

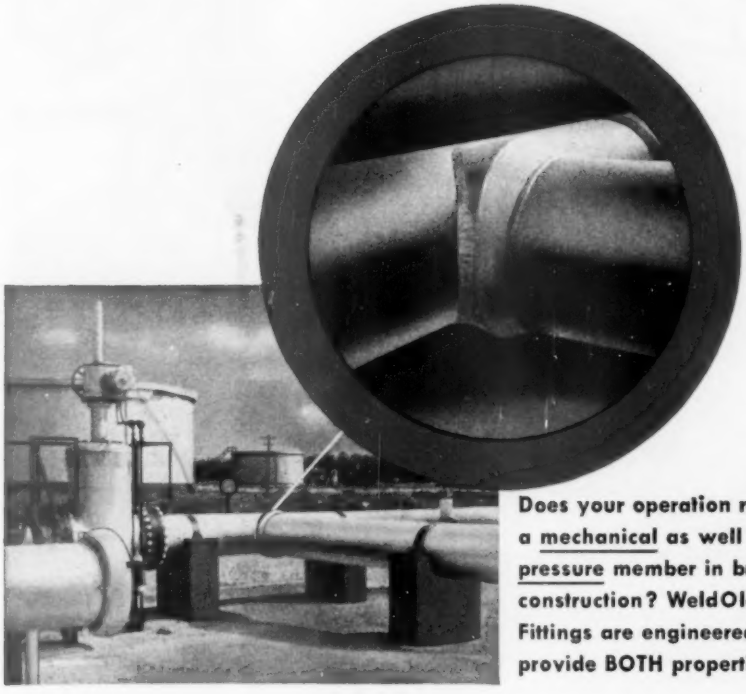
Division Offices: Casper; Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance

Canada: The National Supply Company, Limited, 702 Barron Building, 610 Eighth Avenue, West, Calgary, Alberta

Export: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London, E.C. 2

NATIONAL BLUE PRODUCTS

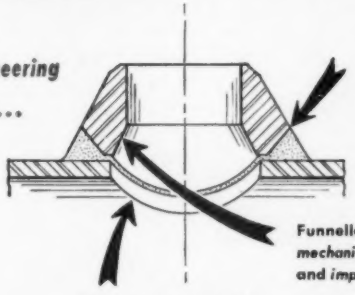
ENGINEERED REINFORCEMENT
FOR YOUR BRANCH CONNECTIONS



Does your operation require a mechanical as well as a pressure member in branch construction? WeldOlet Welding Fittings are engineered to provide BOTH properties.

A big portion of your engineering job is done for you, if you...

Specify Bonney WeldOlet Welding Fittings to Insure Permanent Strength



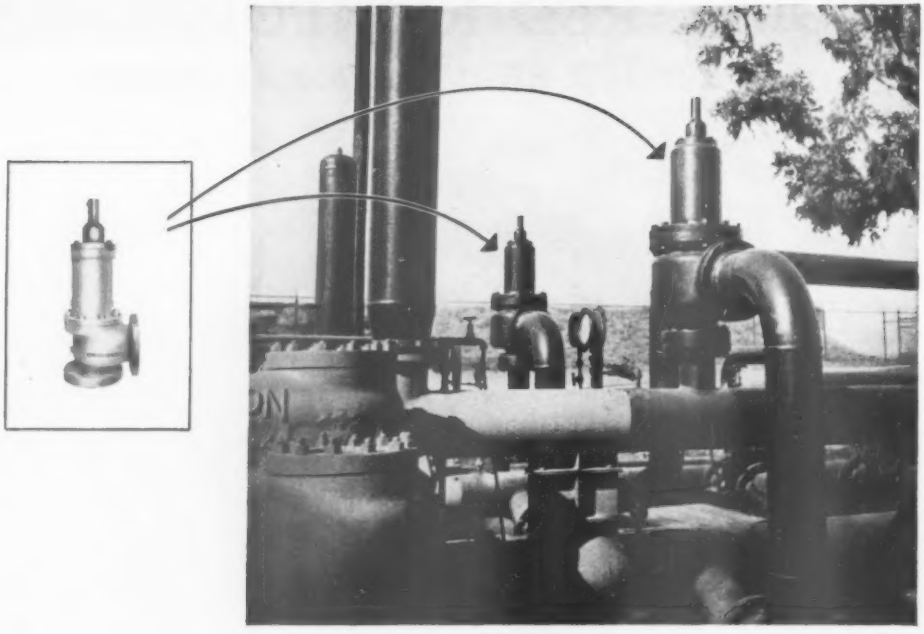
Reinforcement where both the mechanical and internal *stresses are most severe*

Funnelled to relieve *mechanical stress concentrations* and *improve fluid flow*

Shaped and beveled for *clean, quick and economical installation*

FOR COMPLETE ENGINEERING DATA WRITE FOR YOUR BONNEY W3 WELDOLET CATALOG

WELDING FITTINGS DIVISION
BONNEY FORGE & TOOL WORKS
ENG. DEPT., 366 GREEN STREET
ALLENTOWN, PENNSYLVANIA



Consolidated Safety Relief Valves installed in pumping equipment at Cities Service Refining Co., Lake Charles, Louisiana.

FIRST LINE OF DEFENSE AGAINST OVERPRESSURES

Refining operations demand absolute protection against overpressures in piping, processing equipment and storage tanks. That is why so many companies use Consolidated Safety Relief Valves to safeguard life, property and production.

Consolidated Safety Relief Valves have outside bevel seat and floating guide construction. The disc moves on a radial seating surface—no leakage under discharge piping stresses. Perfect protection—complete tightness—is assured in the severest service.

Consolidated Safety Relief Valves are simple in design—have 25% fewer parts. Maintenance is reduced—service life is increased—standardization problems are minimized. You can be certain of continuous performance at the rated capacity.

Defense needs and growing civilian requirements are straining the capacity of existing facilities 'round the clock. So, be sure of complete protection against overpressures. Install Consolidated Safety Relief Valves. For details of their enduring quality and operational features, get in touch with your local distributor.

1879 CONSOLIDATED U.S.A.

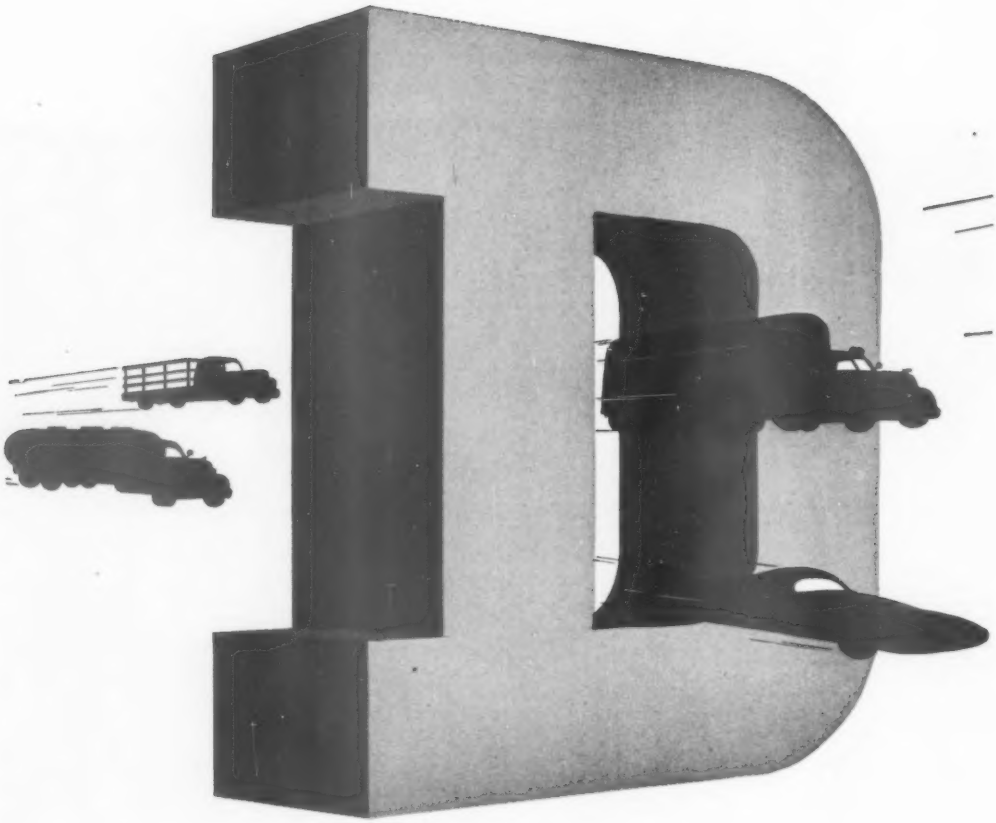
CONSOLIDATED SAFETY RELIEF VALVES

A product of MANNING, MAXWELL & MOORE, INC. TULSA, OKLAHOMA

MAKERS OF 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

FULL CIRCLE FOR FULL VALUE!

ONE-PIECE CONNECTING RODS **. . . protect GARDNER-DENVER MUD PUMPS against failure caused by loose or broken connecting rod bolts. One-piece high lead bronze connecting rod bearings wear longer and are easily replaced. Write for Bulletins FX-10 and P-70.**



DAVISON DEPENDABLE CATALYSTS BUILD BETTER MOTOR FUEL

The operating efficiency of synthetic fluid-type cracking catalysts is important. This operating efficiency can be assured by uniformity of physical characteristics and chemical purity. Davison's production of microspheroidal (M-S*) is tops in uniformity . . . providing all users with a highly efficient synthetic fluid-type cracking catalyst. Your requirements can also be supplied in ground (DA-1*) form. Write for further descriptive information. Experienced Davison Field Service Engineers backed up with complete laboratory testing facilities are part of Davison's service.

*T.M.T.D.C.C.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

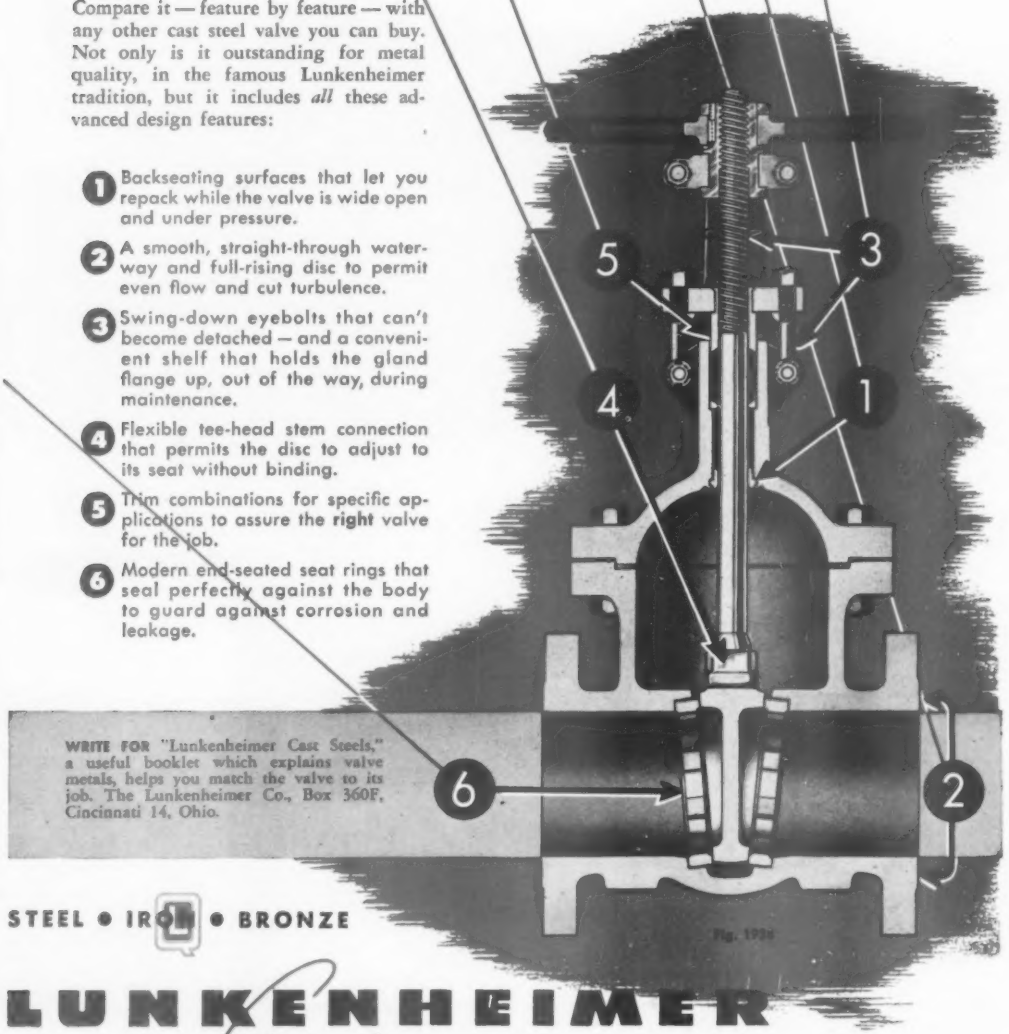
PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

Here's the Only 300 Lb. Steel Valve Which Gives You

All These Features

Compare it — feature by feature — with any other cast steel valve you can buy. Not only is it outstanding for metal quality, in the famous Lunkenheimer tradition, but it includes *all* these advanced design features:

1. Backseating surfaces that let you repack while the valve is wide open and under pressure.
2. A smooth, straight-through waterway and full-rising disc to permit even flow and cut turbulence.
3. Swing-down eyebolts that can't become detached — and a convenient shelf that holds the gland flange up, out of the way, during maintenance.
4. Flexible tee-head stem connection that permits the disc to adjust to its seat without binding.
5. Trim combinations for specific applications to assure the **right** valve for the job.
6. Modern end-seated seat rings that seal perfectly against the body to guard against corrosion and leakage.



WRITE FOR "Lunkenheimer Cast Steels," a useful booklet which explains valve metals, helps you match the valve to its job. The Lunkenheimer Co., Box 360F, Cincinnati 14, Ohio.

STEEL • IRON • BRONZE

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-951-2

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
313 WILSON, SO. NORWALK, CONN.

Dunn Bros., Inc. use a Lorain-TL Moto-Crane to unload 127 cars of 30 in. diameter, 31 ft. long steel gas line sections used for a 10.4 mile long loop at Carlsbad, New Mexico, for the El Paso Gas Co. pipeline.

DUNN BROS., INC.

DALLAS, TEXAS

HAVE DONE IT AGAIN WITH *LORAIN*

They Traveled a Moto-Crane

467 Miles in 21½ Hours

● Dunn Bros. really "move" on the job when they use one of their 6 Lorain-TL Moto-Cranes. For instance, look at this timetable on a recent move to string 30" pipe for a 10½ mile loop, for the El Paso Gas Co.

Left Farmington, New Mexico 9:30 A.M.
Arrived Vaughn, New Mexico 12:30 Midnight same day
Left Vaughn the following morning at 8:30 A.M.
Arrived Carlsbad, New Mexico at 3:00 P.M.

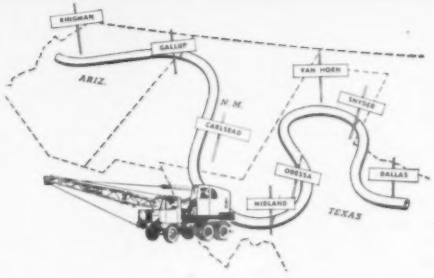
That's 467 miles in 21½ hours driving time and many of those miles were over slippery, snow and ice covered mountain roads.

That's real mobility—the kind that keeps a job "on the move". And when a Lorain Moto-Crane gets *on* the job, it handles things quickly, easily, smoothly. No wonder Dunn Bros. Superintendent B. F. Carter says, *"This Lorain Moto-Crane is the best unit we have ever had to handle pipe. It is fast and extremely portable."*

There are Lorain Rubber-Tire Cranes up to 45-tons lifting capacity and crawler types of machines up to the 2-yard class as shovels.

Used as cranes, draglines, clamshells, shovels or hoes, they do a real job in the field, on the pipeline and at the refinery.

The Dunn Bros. have the answer to low-cost pipe stringing. Lorain distributors across the nation can answer your problems, too, whether it be pipe stringing or in some other phase of the petroleum industry, and show you how the complete Lorain Line—the many turntable capacities and types of mountings—can gear your operations to greater profits.



MILES MEAN NOTHING TO A MOTO-CRANE

Since leaving Dallas on November 20, 1949, (to the end of 1951), the Dunn Bros. Lorain-TL Moto-Crane and its crew have operated as far west as Kingman, Arizona, and have handled a total of 120 miles of 30 inch line and 220 miles of 24 inch steel gas line, plus numerous other jobs connected with pipelining. The Moto-Crane always travels under its own power, handling many scattered jobs and saving time on every move. As many as 50 carloads of pipe have been unloaded in one shift. The Lorain not only unloads railroad cars, but reloads onto trucks for delivery into the field. That's the kind of pipe stringing that has made Dunn Bros. one of the leaders in their field.

THE THEW SHOVEL CO., LORAIN, OHIO

THEW® LORAIN PIPELINER

Wherever Oil is Found.....

Throughout the free world, you'll find Axelson petroleum pumping equipment. The reason? 60 years of experience in the field and an in-plant technical research policy have assured the Petroleum Industry highest standards of quality in scientific design, on long lived materials and precision craftsmanship. Axelson deep well pumps, sucker rods, and related accessories are *leaders* wherever oil is found.

PETROLEUM PUMPING EQUIPMENT

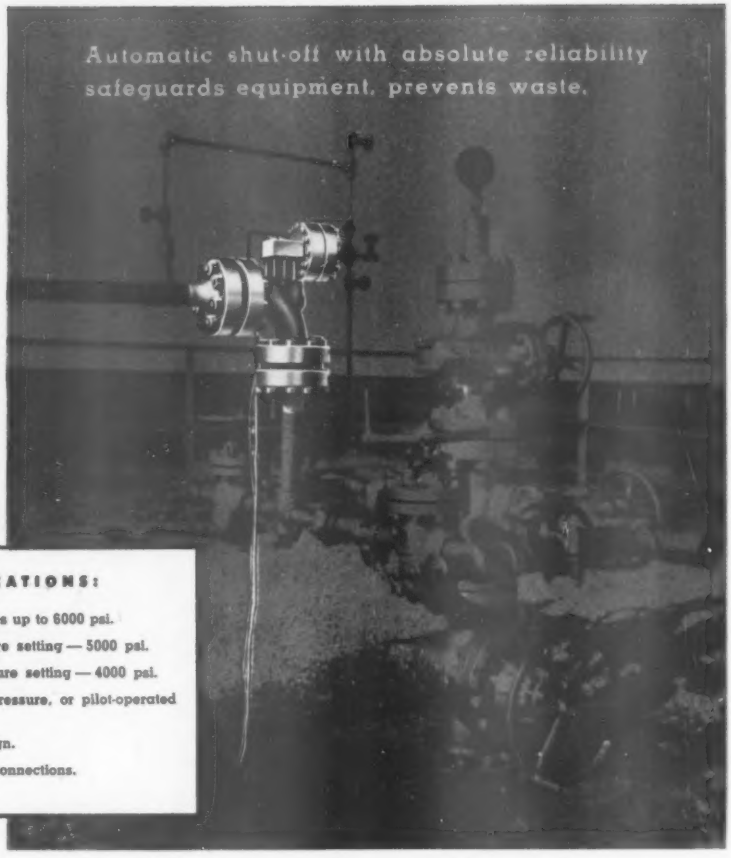
....is chosen first....to last!

OUR 65th YEAR

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON MANUFACTURING CO. • PLANTS: Los Angeles 58, Calif., St. Louis 16, Missouri. OFFICES: New York City 7, New York; Tulsa 3, Oklahoma; Buenos Aires, Argentina. DISTRIBUTORS: Jones & Laughlin Supply Co.; Great Northern Tool & Supply Co.; Industrial Agencies, Ltd., San Fernando, Trinidad, B. W. I.; Industrias Waidrip & Campbell, Barcelona, Caracas and Maracaibo, Venezuela; South American Supply Co., Ltd., Lima, Peru; Sociedad Comercial de Materias Primas Limitada, Rio de Janeiro, Brazil; G. Saavedra e Hijos, S. de R. L. Avenida Morelos 31, Mexico, D. F.; Dominion Oil Field Supply Co., Ltd., Calgary, Canada.

For
WELL HEAD
PROTECTION
use
GROVE
MODEL 390



SPECIFICATIONS:

- Controls well pressures up to 6000 psi.
- Maximum overpressure setting — 5000 psi.
- Maximum underpressure setting — 4000 psi.
- Overpressure, underpressure, or pilot-operated combination units.
- Angle or in-line design.
- Screwed or flanged connections.

If well flow lines should fracture or freeze . . . if other equipment should fail—will you be ready? For any well head emergency, Grove Model 390 Protection Systems automatically stop the flow—dead tight! They operate as often as required—many times a day, or once in a lifetime. Overpressure or underpressure settings are easily made or changed in the field. Resetting can be manual or automatic.

Model 390 main and pilot valves utilize the patented Grove Dome-loaded Diaphragm-operated principle. Pressure range is universal. Loading is quick and accurate. Elimination of springs, pistons and stuffing boxes assures a tight seal with no chance of corrosion or sticking.

Grove automatic Well Head Protection Systems offer the safest, surest emergency shut-off control available. Wire or write today for detailed technical information.

GROVE

The reliability of Grove Valves and Regulators is proved by the thousands of successful installations handling air, gas, oil, water and other fluids. For the solution to your control problems, contact the nearest Grove representative.

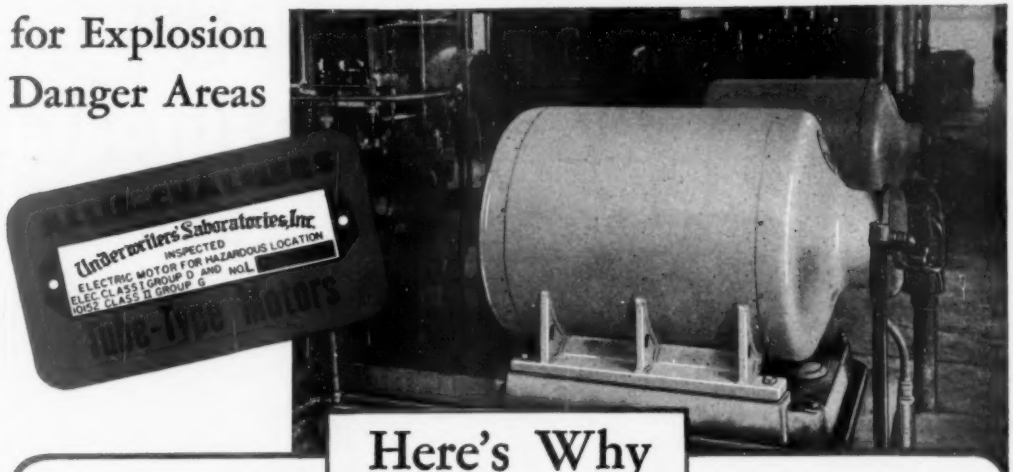
MODEL 390 WELL HEAD PROTECTION SYSTEMS

GROVE REGULATOR CO. 80th and HOLLIS STREETS, EMERYVILLE, CALIFORNIA
1801 CALUMET, HOUSTON 4, TEX. • 415 LEXINGTON AVE., NEW YORK 17, N. Y.

DISTRICT OFFICES: Dallas, Corpus Christi, Odessa, Texas — Lafayette, Louisiana — Tulsa, Oklahoma — Los Angeles, California

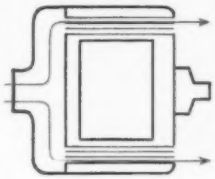
Your *Best* Motor Buy

for Explosion Danger Areas


Underwriters' Laboratories, Inc.
INSPECTED
ELECTRIC MOTOR FOR HAZARDOUS LOCATION
ELEC. CL. ASS I GROUP D AND NO.L
IONS CLASS II GROUP G
Tube-Type Motors

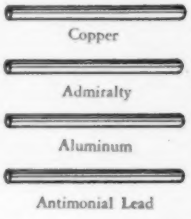
Here's Why

Practically Self-Cleaning



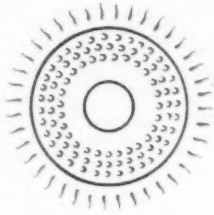
Air-to-air heat exchanger has straight, smooth tubes with no pockets to collect dirt or moisture. Velocity of cooling air through tubes keeps surfaces swept clean. If sticky dirt piles up, tubes can be cleaned quickly with long handled brush.

Choice of Tube Materials



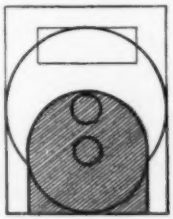
Allis-Chalmers tube-type motors can be built for service in corrosive atmospheres. Tubes may be made of a variety of materials. Motors will carry Underwriters' Label for Class I Group D or Class II Group F or Class II Group G.

Uniform Cooling



Tubes for carrying cooling air are distributed uniformly around the perimeter of the stator and along its full length. Result: heat travels over a short path and the interior is uniformly cooled.

Compact



Allis-Chalmers tube-type motors are little or no larger than open motors of the same rating. Internal compartmentation divides motor into two chambers, keeping pressure at a lower level should an internal explosion occur.

Get Complete Information Now— Ask your Allis-Chalmers district office representative about tube-type explosion-proof motors in sizes up to 2000 hp with Underwriters' Labels to 800 hp. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, and ask for Bulletin 51B7149.

A-3768

ALLIS-CHALMERS

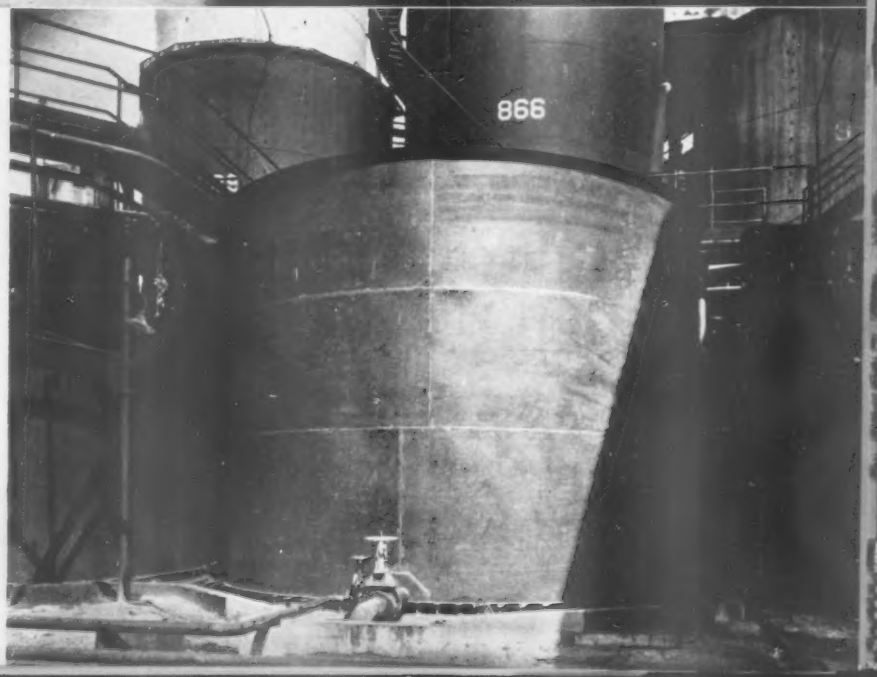
Major Oil Refineries *use*

Inside view of tank showing construction. It was fabricated in three rings with Ampco-Trode electrodes. The top and middle rings are 3/16 inch Grade 8 Ampco Metal plate. The bottom ring is 1/4 inch Grade 8 Ampco Metal plate.

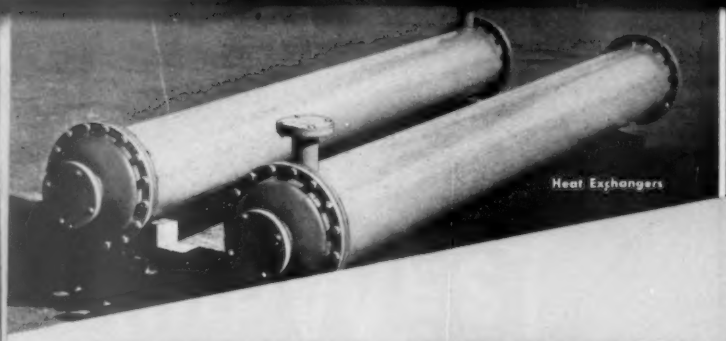
Inner coils are 1 1/2 inch Schedule 80 Grade 8 Ampco Metal Pipe connected with 150 lb. slip-on flanges.

Grade 8 Ampco Metal bolts and Grade 15 Ampco Metal nuts were used throughout.

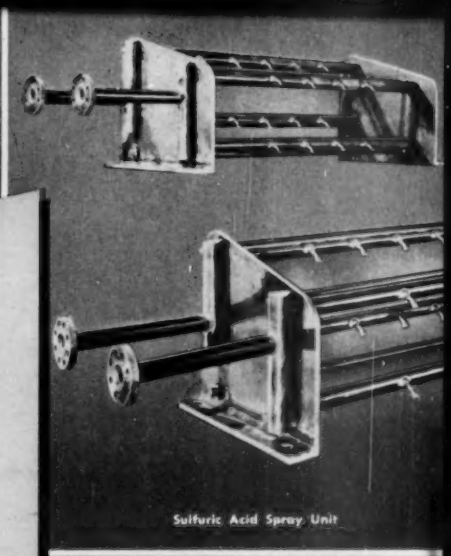
Fabricators: Pacific Coast Engineering Company, Alameda, California.



Ampco Metal sulfuric acid sludge tank in operation at Shell Oil Co.'s Martinez, California plant. Tank is 20 ft. high and 24 ft. in diameter.



Heat Exchangers



Sulfuric Acid Spray Unit

AMPCO* METAL

to hold Sulfuric Acid Sludge

because it RESISTS CORROSION

Fabricating Ampco Metal with Inert Gas Consumable Electrode Welding

Yes, Shell Oil Co. and many other refiners and companies in the process industries use Ampco Metal to solve corrosion problems.

Here's why! Ampco Metal Grade 8, one of a series of engineered aluminum bronze alloys, has these unique properties: high resistance to corrosion . . . high tensile strength (75,000 psi) . . . high physicals at extreme temperatures . . . high strength to weight ratio . . . high impact and fatigue values (Charpy @ -423°F., 93 ft. lbs., @ 70°F. 75 ft. lbs., fatigue limit 28,000 lbs. @ 100,000,000 cycles) . . . high resistance to wear from erosion, abrasion, cavitation-pitting . . . high compressive strength (E. L. in Comp. 25,000 psi) . . . high modulus of elasticity (18,000,000) . . . easy to fabricate with Ampco-Trode* welding wire and coated electrodes.

Ampco Grade 8 has Boiler Code Approval and is available in sheet, plate, extrusions, pipe, tubing and fasteners. It may be the solution to your corrosion problems. Consult your nearest Ampco Field Engineer or write us for further information.

Tear out this coupon and mail today!

*Reg. U. S. Pat. Off. Ampco Metal, Inc., Milwaukee, Wisconsin

Ampco Metal, Inc.

MILWAUKEE 46, WISCONSIN

West Coast Plant —

BURBANK, CALIFORNIA

AMPCO METAL, INC., Dept. OG-7, Milwaukee 46, Wisconsin

Send me information on the application of Ampco Aluminum Bronzes for corrosion-resistant service in the Process Industries.

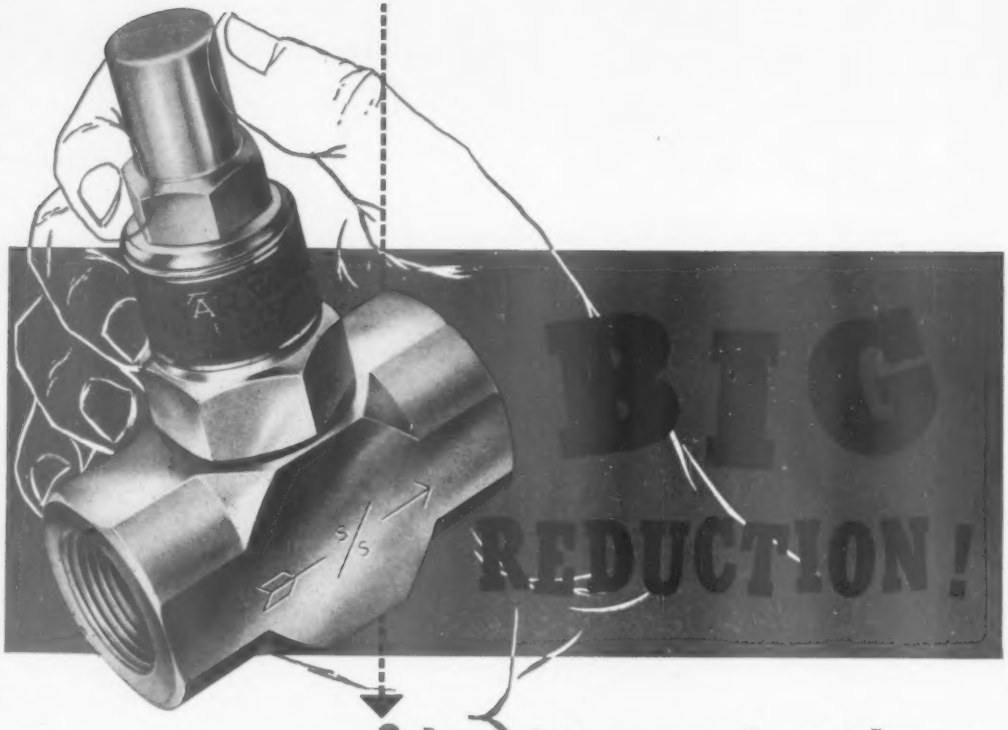
Name..... Title.....

Company.....

Company Address.....

City..... (.....) State.....

PR-7



8-hour job now takes 4 hours

At a western magnesium reduction plant something besides magnesium has just been reduced. The steam at the end of the 1½ mile long steam line wasn't so hot—and neither was the production record of the plant at that location.

Then 26 old-type steam traps were replaced with Yarway Impulse Traps. Now there is only a 15° temperature drop from the boilers to the end of the line. *Most important, the plant 1½ miles from the boilers is now able to do work in 4 hours that previously took 8 hours.*

That's trap efficiency! It's evidence of the fact that Yarways are designed to send the most premium B.T.U.'s at top temperatures into your process or product. *They get equipment hotter, sooner . . . and keep it hot.*

Other Yarway features—small size, one moving part, easy installation, low maintenance, low cost, stainless steel construction. Nearly 750,000 Yarways have already been installed. For your Yarways, see a nearby industrial distributor . . . 216 stock and sell Yarways.

YARNALL-WARING COMPANY, 136 Mermaid Ave., Philadelphia 18, Pa.

FREE TRAP SELECTOR

It's important to have the right trap in the right place. New 20-page selector tells quickly and easily which *is* the right Yarway trap for any application. Write for your free copy.

YARWAY

the steam trap

designed with more production in mind

MIDWEST
PREFABRICATED PIPING

SAVES LABOR

SAVES TIME

SAVES MONEY

SAVES TROUBLE

From A Simple Bend

Or Welded Assembly

To Complete Piping Systems For Power Plant

Or Process

Call On MIDWEST

Midwest Shop-Fabricated Piping saves labor, time, money and trouble in erection. Subassemblies are always practical, with the difficult operations performed in the fabricating plant. Field welding is simplified as much as possible. All pieces are accurate in alignment and dimension . . . they are thoroughly cleaned to remove all scale and dirt . . . carefully inspected and tested . . . stress relieved when necessary . . . ready to erect quickly, easily at lowest cost. It is to your advantage to use Piping Prefabricated by Midwest.

MIDWEST PIPING SERVICE IS NATION-WIDE

4 Plants Are Better Than 1

PIPING FABRICATORS AND CONTRACTORS

MIDWEST PIPING & SUPPLY CO., INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants in Louis, Passaic, Los Angeles and Boston

Sales Offices: New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—952 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

SUPPLY
BOVAIRD
COMPANY

"Buy From Bovaird"

Bovaird

Q ...WHO made it possible for refiners to use tetraethyl lead antiknock compound?

A ...DU PONT!

In 1923, Du Pont put into operation the first safe, commercial process for making tetraethyl lead. And, until September 1945, Du Pont was the *only* manufacturer of TEL in the United States.

What's more, since 1923, Du Pont has produced approximately 60% of all the tetraethyl lead used in gasoline in this country to date.

Today, Du Pont is expanding its TEL manufacturing facilities with the addition of a new plant. And its technical, research and marketing services have more than kept pace with its production expansion. A Du Pont representative will be glad to explain how the many Du Pont services can be helpful to you.

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & CO., (INC.) • Petroleum Chemicals Division, Wilmington 98, Delaware

JONES SUCKER RODS

Endurance and uniformity are added to all Jones Sucker rods by controlled full length normalizing. Forging strains and heat demarcations are removed. Grain structure is refined.

Physicals of Jones nickel alloy rods are improved by both normalizing and tempering.

THE S. M. JONES COMPANY
Division of Buffalo-Eclipse Corporation
General Office and Factory: TOLEDO, OHIO
Sales Office: Kennedy Building, Tulsa, Okla.
Export Sales Office: Buffalo International Corp.
50 Church Street, N. Y. C.

LOOK FOR THE GREEN RODS

You Can RELY ON ROCKWELL

"201" ORIFICE METERS

MEASURE MORE... AT LESS COST!

THE ROCKWELL INTEGRATOR

Calculates CHARTS WITH MACHINE PRECISION

The operator of a Rockwell integrator mechanically computes the total extension of flow meter charts by tracing contrasting colored lines over the static and differential lines as made by the meter. The total appears on a direct reading counter, accurate to ½ of one per cent or closer. One Rockwell integrator will calculate up to 300 average charts a day.

You gain in many ways by using Rockwell orifice meters. The precision engineered, sturdily built mechanism records static and differential pressures exactly as they occur. All operating parts are of heavy stainless steel . . . *made to last!* Routine servicing is easier, too, due to the accessibility that has been built into this design. And with the Rockwell unit manometer construction you can interchange the high side chamber with other chambers of higher or lower range, thus sparing the expense of stocking complete meters.

You also benefit from the new and exclusive Teflon bearing stuffing box that seals bottle tight without lubrication and without binding.

Wherever you measure large volumes; whatever the fluid, whether in plant or field, you figure to measure more at lower costs by using Rockwell orifice meters. Write for bulletin 1050. It gives full facts on all these money saving, money earning features.

ROCKWELL MANUFACTURING COMPANY
PITTSBURGH 8, PA.

Atlanta · Boston · Chicago · Houston · Kansas City · Los Angeles · New York · Pittsburgh · San Francisco · Seattle · Tulsa

250 miles from *in desert*

Working in 150° heat, Tournadozer prepares area for oil derricks. Unit also levels sites for warehouses, fuel dumps, and commissary storage.

Tournadozer proves reliability in oil field exploration

To speed exploration of potential oil fields, Iraq Petroleum Co., Ltd., of Tripoli, Lebanon, is using a highly mobile C Tournadozer to build and maintain roads, level campsites and storage areas, and prepare drill locations.

Currently on expedition to the remote coastal desert country between the Persian and Oman Gulfs in Saudi Arabia, the Tournadozer has to operate in temperatures ranging from 35° to 150° F. Its work is entirely in sand—mostly dune and desert blow sand, with occasional outcroppings of sandstone and coralstone, and some salt flat areas. Despite these severe con-

R. G. LeTOURNEAU, INC.

PEORIA, ILLINOIS

Tournadozer—Trademark Reg. U. S. Pat. Off. EX104-ol

the nearest oasis

temperatures to 150° F.

Building access road from temporary personnel camp to main cross-country highway (the only permanent road along the Trucial coast), Tournadozer drifts 2½ yd. load of sand. Road will be used to transport truck loads of ½ to 25 tons.

ditions, the Tournadozer has been working steadily 10 to 18 hours daily for the past year. Only servicing required during this time has been a routine weekly inspection. Tires have stood up well under the extreme heat and in the abrasive sand that cause excessive wear on the many moving parts of track-type equipment. This trouble-free operation is of prime importance. The nearest major repair facility is more than 250 miles away.

Because of this dependability and greater operating speed, Tournadozer now handles ⅔ of the earthmoving requirements while a crawler-tractor handles only ⅓. By driving from one task to the next at speeds up to 19 m.p.h., Tournadozer has been a major factor in keeping landleveling, road building and road maintenance ahead of schedule.

Another of this machine's major advantages is its simple system of steering and its electric "push-button" blade control. Operation is so easy that inexperienced Arabian workers have very little difficulty in maintaining high standards of production with the Tournadozer.

Like Iraq Petroleum Company, scores of progressive oil companies and governmental departments are taking advantage of this advanced, easy-to-operate earthmoving machine. If you are interested in the economies of modern, rubber-tired, high-speed equipment for faster, lower-cost completion of your projects, your LeTourneau Distributor can help you. He will gladly analyze your equipment needs at any time. Call him the next time you're thinking of adding to your dozer fleet. There's no obligation.

For more TOURNADOZER information . . . write R. G. LeTOURNEAU, Inc., Peoria, Ill.

We're interested in: ☐ specifications ☐ price, delivery information ☐ production analysis on present operation

NAME ..... TITLE .....

COMPANY ..... DEPT. OR DIV. .....

STREET ..... CITY, STATE .....

Type of work, materials to be handled EX104-o1

FOR

YEAR-AFTER-YEAR DEPENDABILITY

CHOOSE EQUIPMENT WITH

CONTINENTAL RED SEAL POWER

CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD

Today's

BROAD AND DIVERSIFIED LINE

OF

CONTINENTAL RED SEAL ENGINES

INCLUDES SOME 80 BASIC MODELS,

BUILT TO MORE THAN

2,000 DIFFERENT SPECIFICATIONS

FOR COUNTLESS APPLICATIONS

ON LAND, AT SEA

AND IN THE AIR

PARTS AND SERVICE EVERYWHERE

Continental Motors Corporation

MUSKEGON, MICHIGAN

7-Month Test proves

BoL Tan® leather insole Sweat-Resistant

Examine closely the two safety-shoe insoles that are illustrated here. They were cut from a single pair of shoes worn by a foundry worker for seven months.

The insole shown on the left is a BoL Tan leather Insole. The other insole is an ordinary leather insole, the standard of the work shoe industry.

The condition of the two insoles reveals the remarkable advantage of the BoL Tan leather insole and its sweat-resistant value.

Note BoL Tan Leather Insole still soft and pliable, shown by cut section lifted for inspection.

BoL Tan Insole remains comfortable, permits re-soling when ordinary leather insole fails.

Ordinary insole is cracked, curled, saw-edged and dried out . . . damaged by perspiration.

Ordinary insole is unfit for further wear. Shoe is discarded long before it is worn out.

H721-4 . . . Men's Brown Steel Toe Blucher, Resist-Oil outsole, Leather midsole, Whole Resist-Oil Heel, Steel Arch.

Only HY-TEST Safety Shoes have BoL Tan leather insoles

Give up to twice the wear and extra comfort, too!

Make sure your workers' feet are protected by HY-TEST Safety Shoes . . . for comfort that pays off in more productive man-hours. And, save your workers the money they'd otherwise have to spend for extra pairs to take the place of the longer wear BoL Tan leather insoles provide in HY-TEST SAFETY SHOES . . . AT NO EXTRA COST.

HY-TEST ANCHOR FLANGE* SAFETY SHOES

*TRADEMARK REG. U. S. PAT. OFF.

The World's Largest Selling Safety Shoe

Division of International Shoe Company, St. Louis 3, Mo.

New York Office: Suite 1708, 225 W. 34th St.

HY-TEST SAFETY SHOES

Use this handy coupon for details on HY-TEST's *BoL Tan* leather insoles.

HY-TEST SAFETY SHOES, Dept. OG7
Division of International Shoe Company
St. Louis 3, Missouri

Please send me free copy of your folder explaining the advantages of *BoL Tan* leather insoles.

Name.....

Firm.....

Address.....

City.....Zone.....State.....

Oklahoma City, Okla.

Dear Boss:

You wanted to know how Lufkin Pumping Units have performed in Oklahoma. Here are a few examples from the Oklahoma City Field:

	Well "A"	Well "B"	Well "C"	
		"A"	"B"	"C"
Well Number:		Sept., 1935	March, 1936	Dec. 1935
Date Unit Installed:		136,500	132,300	134,400
Hours Operated, Total:		1,108,719	1,009,414	987,280
Fluid Pumped (bbls.):		6,500	6,500	6,500
Well Depth, in ft.		$18.20	$38.60	$41.10
Yearly Repair Cost:				

Although these three records are remarkable, there are hundreds of Lufkin Units in Oklahoma with equal, or better, records.

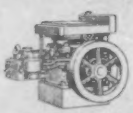
Cordially Yours,
Cooper

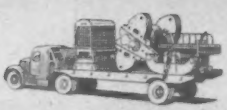
LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

Branch sales and service Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming; Great Bend, Kansas.
Lufkin Equipment in CANADA is handled by
THE LUFKIN MACHINE CO., LTD. 14321 108th Avenue, Edmonton, Alberta, Canada.

LUFKIN PUMPING UNITS


LUFKIN-COOPER-BESSEMER ENGINES


LUFKIN OIL FIELD AND INDUSTRIAL TRUCK TRAILERS

INDUSTRIAL SPEED REDUCERS AND INCREASERS

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

ALL-ROUND usefulness combined with dependable operation — that's one big reason why Bucyrus-Erie rigs are oil field standouts. They're ready to tackle dozens of jobs — trenching, uncovering pipe line leaks, building access roads, leveling at location, digging slush pits, handling drill pipe, moving and erecting equipment. And where speed is vital and lost time costly, Bucyrus-Erie reliability puts you profits ahead.

The day-after-day, year-after-year service records of these outfits don't just happen. Here are some "reasons why" behind Bucyrus-Erie performance:

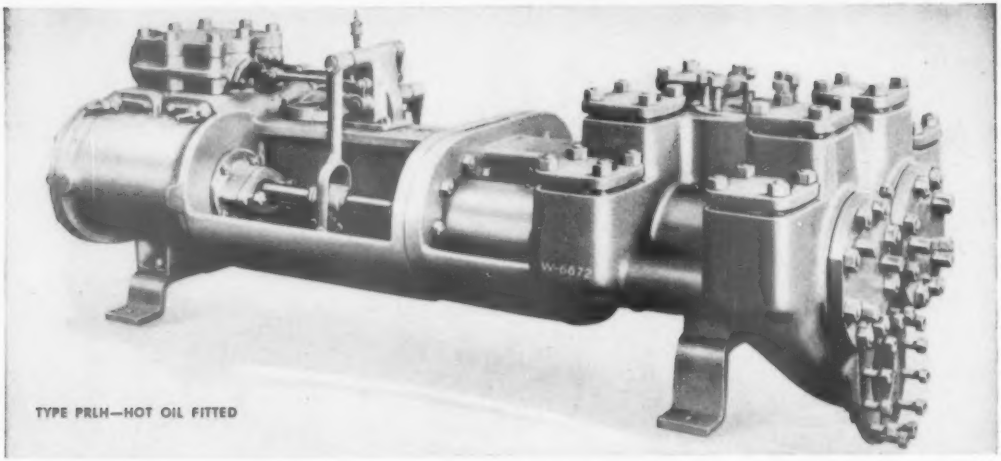
1. Parts are simple, large, few in number and enduringly aligned — there's little to go wrong.
2. All adjustments are easily made — and they last!
3. Machinery is accessible for quick, easy service, parts replacement and lubrication.
4. Digging cycle is balanced, coordinated, fast. No overstressing of parts to cause too-frequent adjustment and repairs.
5. Controls are conveniently grouped in one place — no lost motion from hopping around.
6. Generous use of antifriction bearings makes performance smooth, quiet, easy on machine and operator.
7. Design is individual — each machine matched to its range of work.
8. Moves are fast, sure. Machine steers easily, makes sharp or gradual turns, climbs grades to 30%.

See your Bucyrus-Erie distributor for more details on this outstanding ⅜- to 4-yard line of gasoline, diesel and single-motor electric excavators.

MOST COMPARED . . .
MOST PREFERRED

SOUTH MILWAUKEE BUCYRUS ERIE WISCONSIN

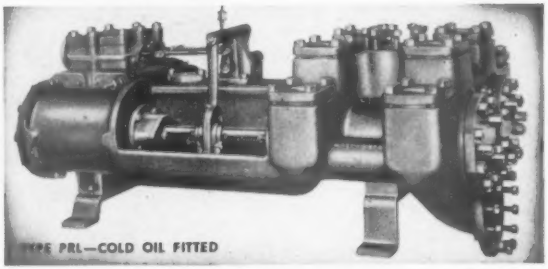
271E51



TYPE PRLH—HOT OIL FITTED

We've Built New and Superior Strength into

Worthington Steam Pumps



TYPE PRL—COLD OIL FITTED

NEW STEAM ENDS RATED UP TO 250 PSI

Steam cylinders and flanges designed for 250 psi maximum working pressure hydrostatically tested to 375 psi . . . Drop-forged steel steam valve gear . . . Heavier piston rods . . . ½ in. minimum drain openings allow heavier pipe connections . . . Those are some of the *strength features* built into Worthington's new line of steam pumps for refinery service.

MORE FEATURES OF ADVANCED DESIGN

Then, for *longer wear*, the steam valve gear is lubricated—oil cups on the rocker arms give longer bearing life.

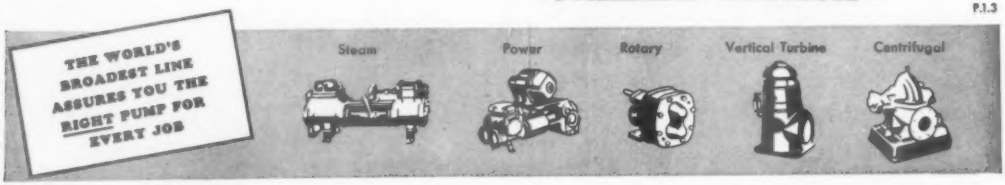
And *accessibility:* two-piece piston rods, either part removable without disturbing the other end . . . flanging on steam cylinder permits easy lagging . . . external cushion valves (on larger sizes).

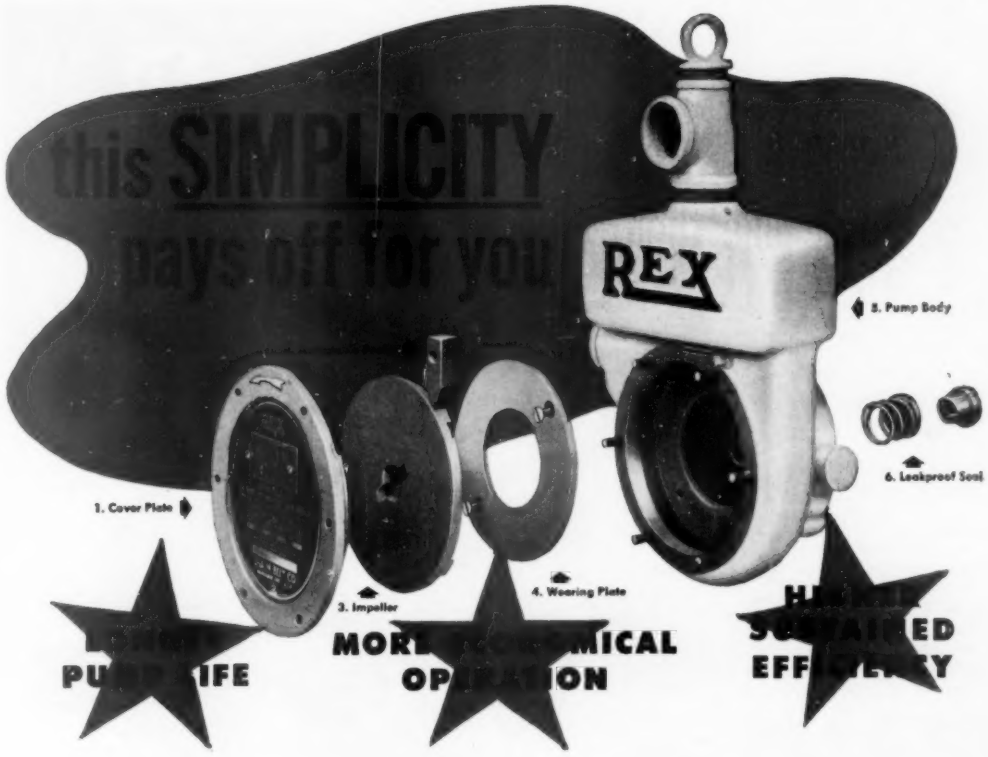
This new line of duplex steam pumps represents Worthington at its best—the broadest range, the finest engineering. It's one more proof that *there's more worth in Worthington*. Write Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Reciprocating Pump Division, Harrison, New Jersey.

WORTHINGTON

P.1.3

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB





The story behind the great performance of the Rex® Oil Field Utility Pumps is *simplicity* itself. The fact is, Rex is the simplest self-priming centrifugal pump ever built. There are only 6 *basic* parts—the cover plate (1)—the adjustable air peeler (2)—the impeller (3)—the wearing plate (4)—the pump body (5)—and the leakproof seal (6).

For you, this extreme design simplicity has great advantages:

You get LONGER PUMP LIFE . . . fewer parts mean less wear.

You get ECONOMICAL OPERATION . . . fewer parts to maintain . . . all parts except stationary part of seal can be inspected, maintained or replaced without touching the engine. All this means less chance for trouble . . . far lower maintenance cost . . . more gallons of water pumped per gallon of fuel and per dollar of cost.

You get SUSTAINED EFFICIENCY . . . this pump is designed for quick, easy replacement of all wearing parts to restore new pump efficiency.

DON'T FORGET THESE OTHER IMPORTANT REX ADVANTAGES

High PORTABILITY

All parts EASILY ACCESSIBLE

REPLACEABLE WEARING PLATE

PATENTED ADJUSTABLE AIR PEELER which assures easy, speedy priming efficiency for the lifetime of the pump.

Combine these all with the basic Rex design simplicity, with all parts readily accessible, and you have a pump that assures years of low-cost, trouble-free service.

Get the complete story from your oil field supply store or write Thomas Bolt Company, 4619 W. Greenfield Avenue, Milwaukee 1, Wis.

REX ® OIL FIELD EQUIPMENT . . .

Some like them green...
Some like them clear...

Safety Goggles

Either Style gives
Wide Vision and Comfort

AO Panoram Goggles

Workers obtain a "picture window" view of the work with AO's Panoram Goggles. Both the "600" model for large and medium size faces and the "800" for smaller faces are available in any combination of green or clear lenses or frames. Rubber cushions are available for utmost comfort when goggle must be worn for long periods of chipping, grinding, babbitting, riveting, spot welding and similar work. Your nearest AO Safety Products Representative can supply you.

Quick Facts

- May be worn directly over eyes or personal glasses
- Plastic frame and lenses
- Perforations in frame for good ventilation and minimizing of fogging
- "Floating" saddle type bridge fits comfortably
- Shatter resistant acetate lens

Specify green color for absorbing ultra violet and reduction of glare.

Register and Vote!

American Optical
SAFETY PRODUCTS DIVISION

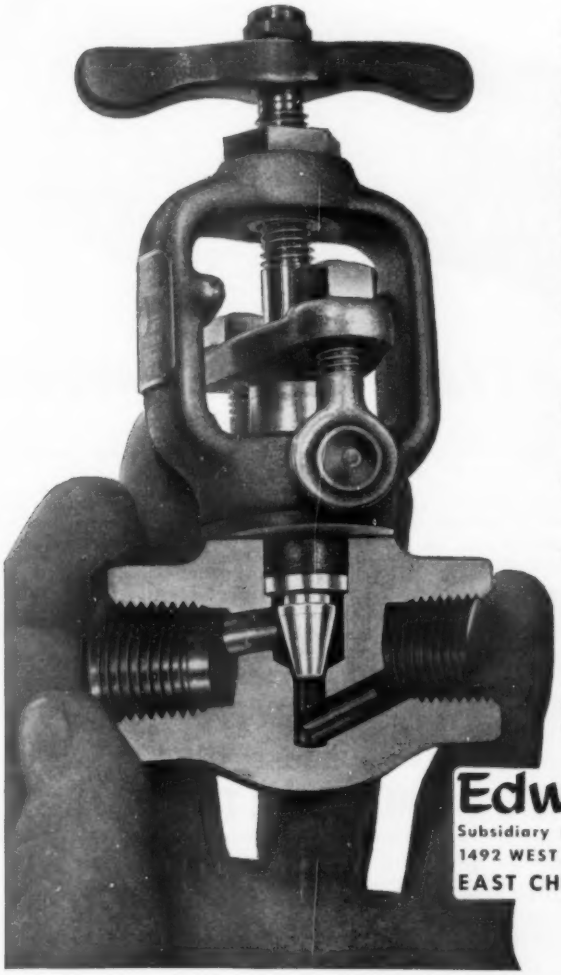
SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

ALL FORGED STEEL

Edward

INSTRUMENT VALVES

Lowest Cost Valves for Their Rating!



Standardize on Edward instrument valves—forged steel, yet their price is comparable to ordinary bar-stock valves.

Edward instrument valves are top-quality in every design detail—easy-grip T-handle . . . bronze yoke bushing . . . forged steel one-piece outside screw yoke . . . forged steel corrosion-resistant EValized packing gland . . . EValloy 13% chromium stainless steel stem-disk with needle point for close flow control . . . forged steel EValized gland bolts that swing out of the way for easy repacking . . . heat resistant die molded EValpak packing.

And look at this versatility—

★ **STEAM, WATER, OIL or GAS PRODUCT PROCESS LINES**

Edward instrument valves fit into any piping system. Globe or angle, sizes ¼", ⅜", ½", ¾" and 1".

★ **HIGH TEMPERATURES or HIGH PRESSURES**

Rated up to 6000 lb at atmospheric temperatures, or up to 1500 lb at 1000 F.

★ **STANDARD or CORROSIVE SERVICE**

Available in carbon steel or 13% chromium bodies and trim.

★ **TYPICAL USES**

Orifice Meters	Regulators
Instrument Panels	Gage Lines
Oil Field Xmas Trees	Drip and Drain Lines
Hydraulic Systems	Pressure Recorders
Vent Lines	Corrosive Lines

Get the full story on Edward instrument valves—*the lowest cost valves for their rating.* Write for Bulletin 491.

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY
1492 WEST 145th STREET, EAST CHICAGO, INDIANA
EAST CHICAGO, INDIANA

Another Product

MANHATTAN RUBBER HOSE

Every time oil moves there's a special Manhattan hose to help. On the drilling rigs that bring in the new wells Ray-Man Rotary Hose with built-in streamlined couplings sets new standards for flexibility, ease of handling and safety.

For transportation by oil tanker, Paranite Oil Loading Hose is designed for rapid delivery between shore and ship. Its Oil-Proof Flexlastic construction is designed for the most rapid delivery possible. Superior strength, safety and leak-proof features make it top choice at most marine terminals.

Other Manhattan hose of equally high quality helps make final deliveries of gas and oil at bulk stations and on tank cars and trucks. Continuing progress in special hose developments for petroleum problems leads the oil industry to look to Manhattan as Hose Headquarters. Write for Catalog No. 6903, covering Hose, V-Belts and other products for the petroleum industry.

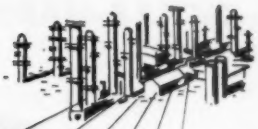
SPECIAL OIL FIELD PRODUCTS DISTRIBUTED BY NATIONAL SUPPLY COMPANY

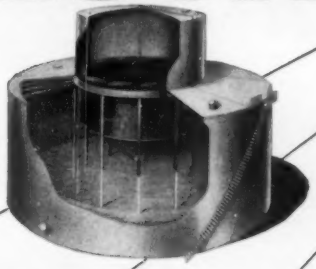
MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

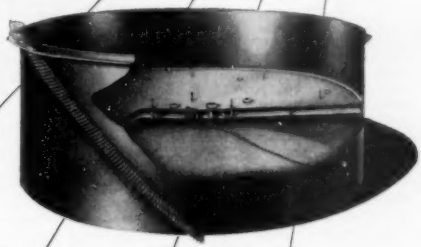
Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks
Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

GRAVER EXCLUSIVES

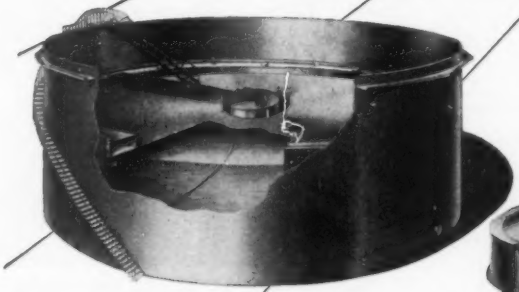




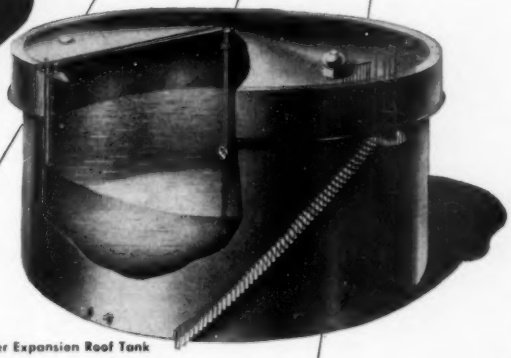
• Graver Vapor-Mizer



• Graver Double Deck Floating Roof Tank



• Graver Center-Weighted Floating Roof Tank



• Graver Expansion Roof Tank

These four Graver fabrications — each a patented design — are built not only to *conserve* but also to *preserve* the quality of the petroleum product. For this reason, the Graver principle of Conservation Control saves the volatile elements of gasoline, thus effecting economy and insuring motorists the same *high quality* that has been built into the motor fuel at the refinery!

GRAVER TANK & MFG. CO., INC.

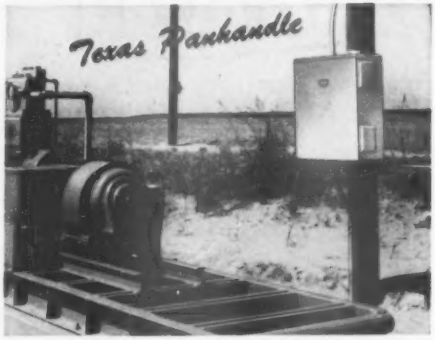
EAST CHICAGO, INDIANA

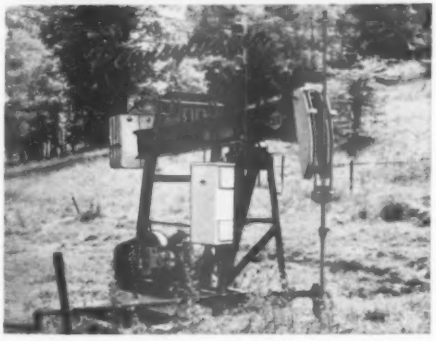
NEW YORK · CHICAGO · PHILADELPHIA · WASHINGTON
DETROIT · CINCINNATI · CATASAUQUA, PA.
HOUSTON · SAND SPRINGS, OKLA.

CUTLER-HAMMER OIL WELL PUMPING CONTROL

BUILT RIGHT PROVED RIGHT

—EVERYWHERE





Cutler-Hammer went to the oil country to design their oil well pumping control. How right they built it is proved by its outstanding performance in the Panhandle, on the Gulf, in both Midwest and East. Here's why operators everywhere prefer it.

Cool operation. Good ventilation, sound construction, properly designed overload heater coils, aluminum painted enclosures keep this controller *cool*. You never see a C-H Controller with its door propped open to keep it working.

Dependable performance in dust-laden air. Triple protected ventilation openings, Cutler-Hammer's exclusive vertical dust-safe contacts, neoprene-gasketed dustproof enclosed timer and timer clock motor with excess torque assure dependable performance.

Automatic staggered restarting. Cutler-Hammer Controller automatically restarts motors in proper sequence after power failures. Controller also available with or without undervoltage relay.

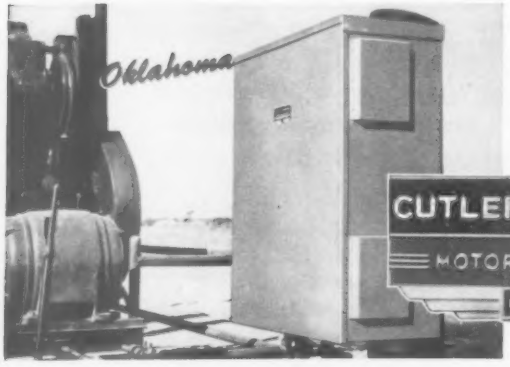
Other features. Lightning arresters are the unit type. If one blows you see it at a glance. And you don't have to virtually rebuild the starter. Changes in pumping sequence are made in definite 15-minute increments by pulling small accessible tabs. Clock is reset after stoppages by turning a handy palm-size dial forward or backward. Wiring diagram, spare parts list and overload heater coil ratings are printed on a plastic-coated, dirt, grease, heat and moisture repellent sheet enclosed in each starter case.

There's dependability, ruggedness and performance plus in these Cutler-Hammer Oil Well Pump Controls. CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

Other Cutler-Hammer Products for the Industry

Bulletin 9586 Across the Line Starter
For standard or high torque polyphase squirrel cage motors. Famous features, *vertical* dust-safe contacts, eutectic alloy overload relay. Rugged construction, ample reserve. Dust-tight or water-tight enclosing case.

Bulletin 9589 Combination Starter
Across the line starter for squirrel cage motors, with side operated knife blade type disconnect switch combined in same special service enclosure. Completely wired. Saves time of installing two separate items.



Yellow Strand is made and stocked in the oilfields FOR BETTER OILFIELD SERVICE!

HOUSTON PLANT

ODESSA WAREHOUSE

What does one delayed delivery of drilling, casing, or other line mean to you? Not in time, but dollars and cents!

Availability of the preferred oil field line—Yellow Strand—is the result of Broderick & Bascom's modern factory at Houston and complete warehouse at Odessa. These facilities back the amply-stocked Continental Stores . . . assuring you of the line you want — *when you want it!*

Standardize on the line that gives you longer life, unexcelled performance, lower costs and prompt delivery . . . standardize on Preformed Yellow Strand from Continental!

CONTINENTAL

SERVING THE OIL AND GAS INDUSTRIES

THE CONTINENTAL SUPPLY COMPANY, *General Offices:* DALLAS, TEXAS
Export Division: The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
The Continental Supply Co., 134-135 Salisbury House, London Wall, London E.C.2, England
The Continental Supply Company, Limited, 216 Lancaster Building, Calgary, Alberta

Representatives: ARGENTINA • BOLIVIA • BRAZIL • CHILE • COLOMBIA • ECUADOR • PERU • TRINIDAD • URUGUAY • VENEZUELA

The Complete Line

OF OIL COUNTRY RUBBER GOODS...

WHERE AND WHEN NEEDED!

New York Belting and Packing Company's *complete* line of oil country rubber goods is conveniently available through the vast network of Continental Stores and Offices. Drilling . . . production . . . transportation . . . processing . . . there's a NYB&P Product to meet your requirements where and when needed.

TEST SPECIAL V-BELTS
HOSE-FOR ALL TYPES OF SERVICE
GREAT SEAL PACKINGS

NEW YORK BELTING & PACKING CO. • Founded 1846

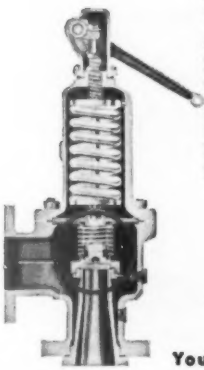
CONTINENTAL

SERVING THE OIL AND GAS INDUSTRIES

THE CONTINENTAL SUPPLY COMPANY, *General Offices:* DALLAS, TEXAS
Export Division: The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N. Y.
The Continental Supply Co., 134-135 Salisbury House, London Wall, London E.C.2, England
The Continental Supply Company, Limited, 216 Lancaster Building, Calgary, Alberta

Representatives: ARGENTINA • BOLIVIA • BRAZIL • CHILE • COLOMBIA • ECUADOR • PERU • TRINIDAD • URUGUAY • VENEZUELA

Stuck without WARNING



Who's stuck? Safety valves that weren't safe? The plant which installed them?

None of this was necessary. If you want 100% safety—and you'd hardly want less—there's one sure way to get it—specify BalanSeal or FarriSeal Valves.

Why? Because they *can't* stick, plug or corrode. Critical working parts are permanently isolated from any contact whatever with the lading.

Because they're unaffected by back pressures in the discharge manifold due to its own operation or to the opening of other valves in the line.

Because these features make it possible for you to use smaller discharge piping, an economy which is often substantially more than the valve cost.

You'll be interested in the engineering of BalanSeal and FarriSeal Valves—design which is rapidly gaining acceptance in hundreds of successful installations.

Ask for our "8-Minute Brief."

Farris ENGINEERING CORP.

412 COMMERCIAL AVE., PALISADES PARK, N. J.

Your Safety's REAL With FarriSeal...

CURTIS P. HARKINS *is probably typical of the men who serve Independent's clients as a Geophysicist, responsible for results. With Independent for 18 years, he has worked at every field job there is in geophysical surveying, including both seismograph and gravity meter methods.*

"EXPERIENCE is the universal Mother of Sciences"

—Cervantes

Particularly the science of oil exploration, Mr. Cervantes

In oil exploration a large measure of the responsibility for success rests squarely upon the professional experience of the Party Chiefs who direct the work in the field. Over a period of more than 20 years many important oil producers have reposed their confidence in Independent Exploration Company. Founded in 1932, Independent is today one of the oldest, most experienced exploration contractors in the business.

You are invited to bring your exploration problems to Independent.

POINTING THE WAY IXC FOR THE DRILL

Independent *Geophysical Surveys*

EXPLORATION COMPANY

1973 WEST GRAY ★ HOUSTON, TEXAS

ESTABLISHED 1932

WHY YOU'LL BE BETTER SATISFIED WITH J&L STEEL WIRE ROPE

Jones & Laughlin Steel Corporation takes wire rope very seriously, with YOU in mind. They have never been quite satisfied to have you buy J&L Wire Rope on impulse, or as a matter of convenience. They want you to buy it deliberately, fully realizing that you get more for your money—longer service and a wider margin of safety.

As a result of this attitude J&L Wire Rope is always a very fine piece of mechanism. In a J&L Wire Line for drilling, or in J&L Wire Rope for any other purpose, there are carefully considered engineering reasons, time proven, for the steel used, for the way the wires are drawn, for the way the strands are laid, for the center employed, for the type of internal lubrication used.

Once you discover for yourself the advantages of wire rope made of J&L steel to J&L standards you are likely to be better satisfied with wire rope performance.

Please discuss this with the men at your nearby Jones & Laughlin Supply store. They can point to local examples of the greater economy and efficiency of J&L Wire Rope.

Jones & Laughlin Supply Company

EXPORT: 405 Lexington Ave., New York, N. Y., U. S. A.

88 STORES • 19 OFFICES • 9 RESIDENT SALESMEN

General Offices: TULSA, OKLAHOMA

J&L STEEL

Subsidiary of Jones & Laughlin Steel Corporation

Go by these plain, hard Facts . . . and SAVE!

CHEVROLET Advance-Design TRUCKS

Fact No. 1

Saves you money on purchase

Check the price on a Chevrolet truck that's the right size, type and capacity to handle your work. You're going to find that this Chevrolet truck lists for less than any other make of truck capable of doing the job. Here's an immediate, cash saving.

Fact No. 2

Cuts operating costs

Day in, day out a Chevrolet truck works for rock-bottom "wages" on fuel and upkeep. It brings you the proved economy of Valve-in-Head engine, with 4-Way Lubrication to reduce engine wear. Extra-rugged features cut maintenance costs.

Fact No. 3

Gives you the right truck for the job

Chevrolet trucks are factory-matched to the job—tires, axles, frame, springs, engine, transmission, brakes. It's the Chevrolet idea to provide you with exactly as much truck as you need and no more. Chevrolet truck users know this idea pays off.

Fact No. 4

Saves money on trade-in

It's right in the records that Chevrolet trucks traditionally bring more money on the used truck market—and that can mean more money for you when you trade or sell. There's another reason why more truck users choose Chevrolet than any other make.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load • POWER-JET CARBURETOR—for smooth, quick acceleration response • DIAPHRAGM SPRING CLUTCH—for easy-action engagement • SYNCHRO-MESH TRANSMISSION—for fast, smooth shifting • HYPOID REAR AXLE—for dependability and long life • TORQUE-ACTION BRAKES—on light-duty models • PROVED DEPENDABLE DOUBLE-ARTICULATED BRAKES—on medium-duty models • TWIN-ACTION REAR BRAKES—on heavy-duty models • DUAL-SHOE PARKING BRAKE—for greater holding ability on heavy-duty models • CAB SEAT—with double-deck springs for complete riding comfort • VENTI-PANES—for improved cab ventilation • WIDE-BASE WHEELS—for increased tire mileage • BALL-TYPE STEERING—for easier handling • UNIT-DESIGNED BODIES—for greater load protection • ADVANCE-DESIGN STYLING—for increased comfort and modern appearance.

CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN

CHEVROLET first in demand in value in sales

NOW—a practical way to PROTECT THIS VITAL ZONE against corrosive attack!

The steel structures supporting your off-shore rigs are in a tough spot.

They need *3 kinds* of protection against the corrosive effects of salt air, water and spray.

For surfaces below low tide – *cathodic protection.* No problem here especially if you hang your magnesium anodes on corrosion-resisting Monel® cables to keep them from getting lost.

For high parts of the structure that the waters do not reach, *paint and other organic coatings* supply adequate protection. Again no problem.

But in the third area – the tidal and splash zones – the need is for something entirely different. There is always enough salt water in this zone to stimulate corrosion, yet too little to provide continuous cathodic protection. And although paints and coatings can be applied before the structure is erected, it's not an easy job to renew them even in quiet waters.

What's the answer? *Monel sheathing.* It can be added to structures already in the water (see photo) whether pilings are cylindrical shapes or H-beams. Or it can be applied on land when the structure is built. Three years ago, Monel sheathing was applied to steel supports prior to setting up a platform in the Gulf of Mexico. Today it is still furnishing excellent protection against corrosive attack. Either way, it offers a dependable way of extending the life of supports in the splash and tidal zones.

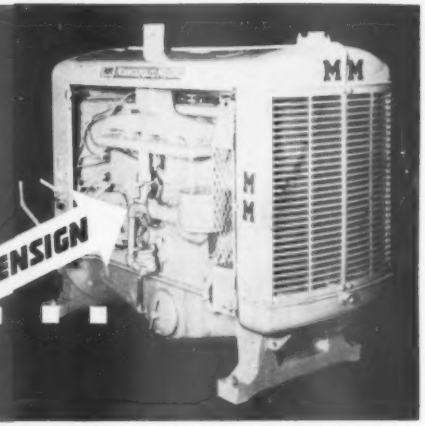
Consider Monel sheathing for your own off-shore steel platforms. It's practical... economical... long-lasting. Write R. E. Reddell, of our Inco Nickel Alloys Department, for more information. No obligation, of course.

If the supports of your off-shore structures are rusting away, a good way to protect them is by sheathing with Monel. This job was performed on a two-year-old platform in Gulf waters by a welding crew working from a small boat. Note: Photo was taken at extremely low tide. Cathodic protection of piling actually extends several inches above low-water mark due to water absorption by attached marine growths, making it unnecessary to extend sheathing below water.

INCO Monel... YOUR PARTNER IN PROGRESS

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

choose a GAS engine!...



FOR OIL FIELD POWER

● This popular Minneapolis-Moline gas engine is specially built for oil field operation. Every detail influencing engine longevity including the carburetion and fuel system has been carefully tested and field proved by years of service on thousands of engines.

Ensign does a good consistent job of carburetion year in and year out. Easy to start and easy to adjust. Dependable, economical and built to outlast the engines on which they are installed.

When you buy oil field power, not only CHOOSE A GAS ENGINE but insist on Ensign carburetion—accept nothing less.

ENSIGN
CARBURETOR COMPANY

7010 S. ALAMEDA ST., HUNTINGTON PARK, CALIF.

DEALERS AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

HUNTINGTON PARK, CALIF.

CHICAGO 36, ILL.

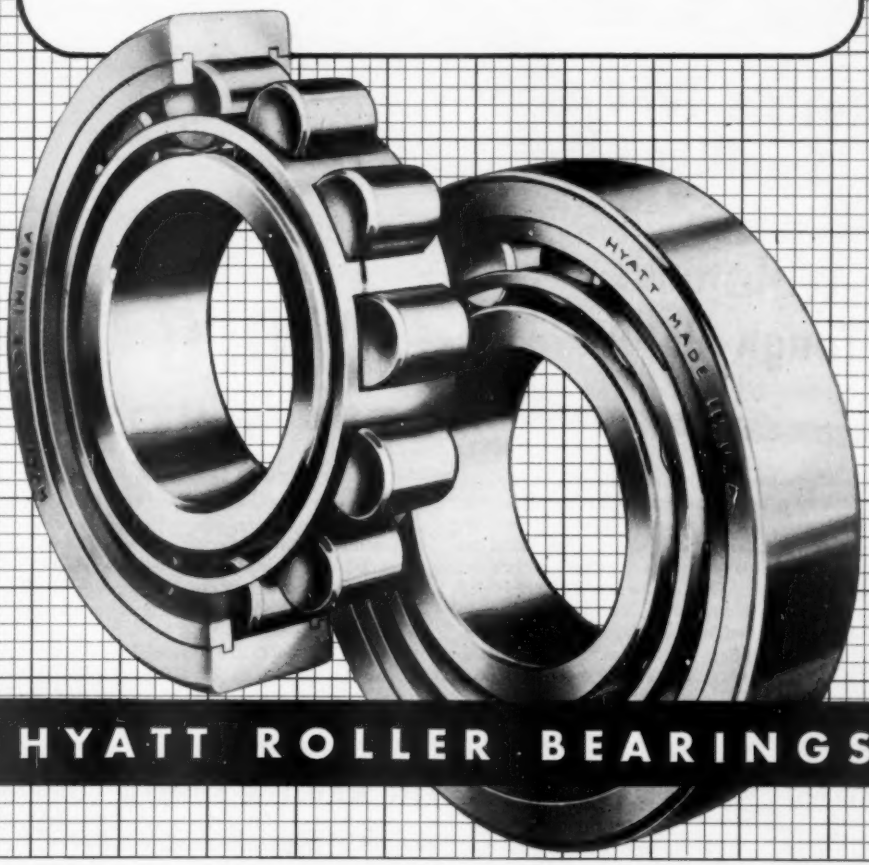
LOS ANGELES 23, CALIF.

●*This advertisement is one of a series featuring popular makes of gas engines in field service.*

Ask the men who operate drilling and pumping equipment about HYATTS

Look over the petroleum production field—study the performance records over the years—note the names of the manufacturers of drilling and pumping equipment who "build in" Hyatt Roller Bearings to give you the service your continuous operation demands and you'll find Hyatts on top—the preferred roller bearings, in petroleum production work.

Add up the opinions of equipment manufacturers—the design engineers who select Hyatts for the tough jobs—and ask the men who man the drills and pumps—they'll all confirm the fact that Hyatts have the rugged endurance necessary for day after day performance. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.



HYATT ROLLER BEARINGS

SPECIAL STAINLESS STEEL INNER WIRE BRAID IS SECURELY LOCKED TO INSIDE WALL OF TUBE. You get this added safety protection and assurance of longer hose life only with CONCORD #20 STEAM HOSE . . . another of BWH's significant developments in the field of mechanical rubber products!

Resists Tube Swelling

Withstands Tough Usage

Concord #20
STEAM HOSE

Here's the steam hose with built-in long life . . . in the form of a special stainless steel inner wire braid.

This inner lining is there to fight tube swelling under continuous high pressure . . . a condition that kills ordinary steam hose — and usually kills it *fast.*

Found only in CONCORD #20 STEAM HOSE, this protection helps assure retention of original inside hose diameter . . . acts against swelling and constriction of tube . . . promotes full flow of steam and easy recoupling in the field when necessary.

CONCORD #20 includes other construction features: two or three braids (depending on size) of alternate high tensile steel wire and rubber layers firmly bonded over outside of tube for maximum burst protection and safety; an asbestos braid for positive cover adhesion and cover insulation; a rugged, abrasion-resistant cover that withstands the toughest abuse.

Put CONCORD #20 to work for you now . . . get in touch with your nearby BWH distributor today.

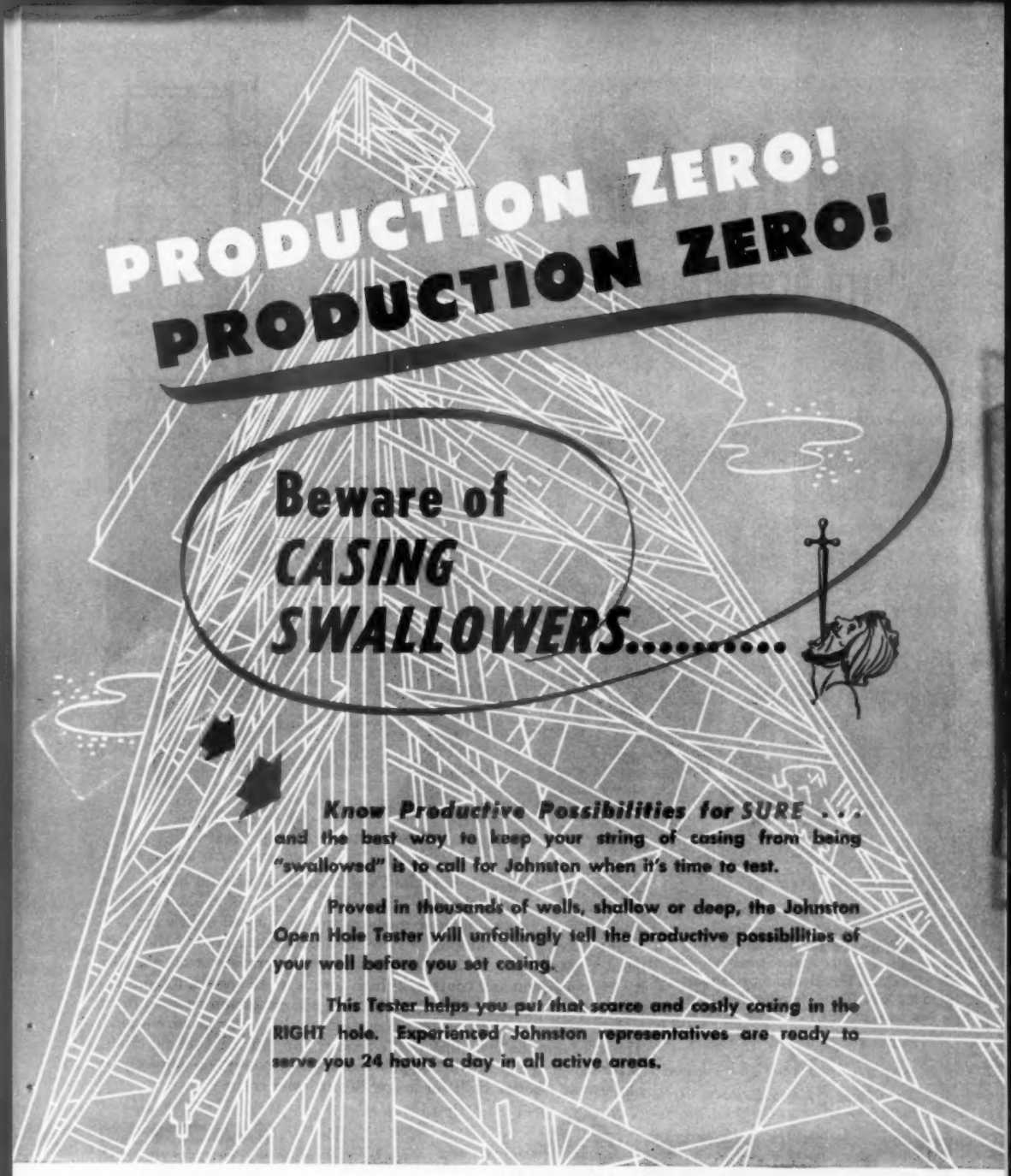
BWH
DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U.S.A.



Know Productive Possibilities for SURE . . .
and the best way to keep your string of casing from being "swallowed" is to call for Johnston when it's time to test.

Proved in thousands of wells, shallow or deep, the Johnston Open Hole Tester will unfailingly tell the productive possibilities of your well before you set casing.

This Tester helps you put that scarce and costly casing in the RIGHT hole. Experienced Johnston representatives are ready to serve you 24 hours a day in all active areas.

JOHNSTON TESTERS, INC.

5702 NAVIGATION BLVD. • HOUSTON, TEXAS

EXPORT DIVISION: 3035 Andrita St., Los Angeles 65, California
SERVICE BRANCHES IN ALL ACTIVE AREAS
There's a Johnston Service Representative Near You

FORMATION AND CASING TESTING
JOHNSTON

Level Off Pumping Costs

WITH DEPENDABLE ENTERPRISE DIESELS

Three Enterprise Dual Fuel Engines move crude ⅓ faster, with a savings of 80% to 90% over former fuel costs for one of California's largest oil producers.

Enterprise Diesels, Dual-Fuel and Spark Ignition Gas Engines, stationary and portable, are built in a wide range of models from 68 to 2056 HP. Generator sets to 1402 KW. Turbocharging available on most models.

Rugged and reliable, Enterprise Diesels are designed and built to cut power costs all along the line—from drilling rig to pipe line terminal. Modern installations of these medium and slow speed diesels are providing exceptional pumping service on a continuous, round-the-clock basis. Contributing to their high economy of operation are 1) simplicity of connection and control, 2) high torque at all speeds, 3) elimination of transmission losses, 4) adaptability to crude and residual fuels, and 5) smooth, vibration-free operation—even under excessive load. They provide the flexibility that's needed, too, using Diesel oil, crude, natural gas or dual-fuel. For *your* next diesel power job, investigate Enterprise—better built for longer life at lower costs.

The Choice of Power Experts

Enterprise
DEPENDABLE
Diesels

ENTERPRISE ENGINE & MACHINERY CO.
A Subsidiary of General Metals Corporation
18th and Florida Streets, San Francisco 10, California

BOSTON • CHICAGO • FT. WORTH • KANSAS CITY
LOS ANGELES • NEW ORLEANS • NEW YORK • SAN DIEGO
SEATTLE • ST. LOUIS • WASHINGTON, D. C.

• In and out of Oil Fields • Laying Pipelines
• Transporting Power and Pumping Units
• Moving Tank Trucks

GENERALS

Do all Jobs

FASTER! EASIER! AT LOWER COST!

When jobs call for extra power and traction off-the-road, depend on the broad-lugged, deep-shouldered GENERAL L. C. M. Shock-absorber construction and more rayon cords per inch assure more strength, more original miles—more recap miles.

When jobs call for some work off-the-road, most on, use the GENERAL H. C. T. Extra thick saw-tooth tread for more traction, more high-speed safety. Tough shoulder cleats prevent snags, cuts, bruises. More original, more recap miles.

Make Every Worn Tire Work Longer for More Profit!

Your GENERAL TIRE DEALER will KRAFT SYSTEM RECAP Worn Tires with the New GENERAL Truck Tire Tread of Your Choice

KRAFT SYSTEM RECAPPING
A GENERAL TIRE SERVICE

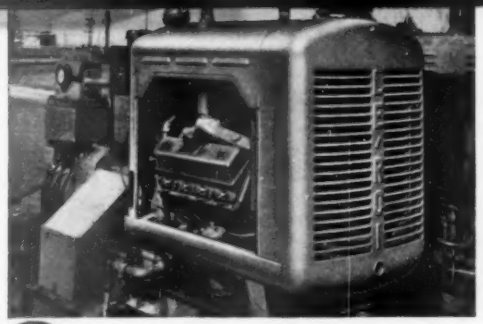
You're throwing away money when you throw away worn tires or accept an ordinary "adjustment" for them. Let your General Tire Dealer—a tire expert—restore worn tires with famous factory controlled Kraft System Recapping. You choose from the complete line of on and off-the-road new General Tire treads and he'll put that tread on your worn tire. He can do sectional repairs too. Get Kraft System Recapping—get more profit from every tire.

SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT

Le Roi 3 way Partnership

1 Better Engines. An example is the modern Le Roi A288 well-pumping engine located at a major oil company's lease in Oklahoma City. This engine has run 282,952 HP-hours at about one half the cost per HP-hour the company considers a good average. That's typical of Le Roi's progressive design policy to meet your problems.

24-hour-a-day



2 Better Applications. Exclusive Le Roi distributors and factory men are oil-field power specialists. They know engines and how to recommend best operating speeds and accessory combinations to give you low-cost, lasting power.

3 Better Service. Keeping your Le Roi engines running is the sole responsibility of our distributors and Tulsa branch-office staff. Parts on hand when you need them, top-notch service men on 24-hour call, and unexcelled overhaul facilities assure your getting the most out of Le Roi oil field engines.

service for 5 years

in sour gas...never overhauled

That's Le Roi performance at this pipeline booster station, under most difficult operating conditions in district

And Le Roi's are still going strong — pumping 27,000 barrels daily, to hold 1,000 psi line pressure.

At this booster station — owned by a major pipeline company — the top-notch performance of one Le Roi F1500 led to the purchase of two more F1500's and two Le Roi L3000's.

Though one of these engines is now almost five years old, none have needed overhauling to date — and only very little maintenance has been required. This trouble-free performance has been achieved in spite of unfavorable conditions — dust, heat, and corrosive sour gas.

Because Le Roi's help keep operating expenses to a minimum, installations are being made for pipeline and other oil-field service in an ever-increasing number.

No matter what your engine application, it pays you to find out about Le Roi oil-field power from your nearby Le Roi distributor or supply house. They can show you Le Roi engines at work under conditions similar to yours, and explain the benefits of Le Roi's 3-way partnership.

LE ROI

LE ROI COMPANY

MILWAUKEE 14, WISCONSIN

Plants: Milwaukee • Cleveland • Greenwich, Ohio

Oil Field Headquarters: Tulsa, Oklahoma

See these Le Roi Distributors for a Profitable 3-way Partnership

Oklahoma
Le Roi Company Branch — Tulsa
Carson Machine & Supply Co.— Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company — Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, Louisiana.

North & West Texas, New Mexico
General Machine & Supply Co. — Odessa, Snyder, Texas.
Nortex Engine & Equipment Co.—Wichita Falls, Texas.

Kansas
Carson Machine and Supply Co.—Great Bend

Illinois — Western Kentucky
Western Machinery & Engine Company—Centralia, Illinois and St. Louis, Missouri.

Michigan
Hafer Engine Service — Reed City

Rocky Mountain Area
Gehring Equipment Co. — Casper, Wyoming, Rangeley, Col.

Northern Louisiana & Mississippi
Ingersoll Corporation — Shreveport, Louisiana, and Jackson, Mississippi.

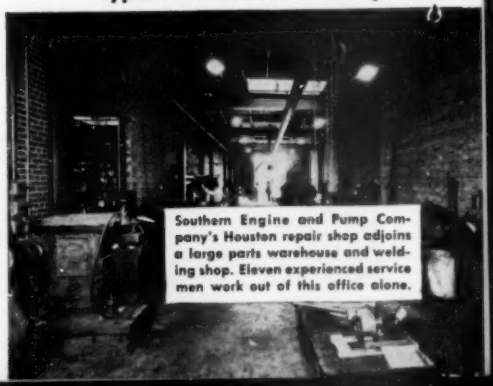
West Coast
Le Roi-Rix Machinery Co. — Los Angeles, Long Beach and Bakersfield, Calif.

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford.

Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

P-113

Typical LE ROI service facility



Southern Engine and Pump Company's Houston repair shop adjoins a large parts warehouse and welding shop. Eleven experienced service men work out of this office alone.

LIGHTWEIGHT—

STRONGER Stainless STEEL

FIRE EXTINGUISHERS

Foam, Soda-Acid, Water Types

WITH NEW INDESTRUCTIBLE *LABELS IN COLOR . . . AN INTEGRAL PART OF THE SHELL, UNREMOVABLE, MORE LEGIBLE, MORE EASILY CLEANED!

Approved by Underwriters' and Factory Mutuals Laboratories

Alfco engineers have utilized the strength, the lightness, the dependability, and the indestructibility of modern stainless steel to make this sparkling new series of 2½ Gallon Alfco Fire Extinguishers, the finest in their price class.

They are twice as strong as the old style fabricated copper units; about 50% lighter in weight without the charge; will retain their luster indefinitely; have new color label (patent pending) that is an integral part of shell, assuring lasting legibility of operation instructions.

All welded construction, elbow and collar silver brazed, no lead solder banks, no acid fluxes, corrosion resistant, both inside and out — a revolutionary improvement in fire extinguisher construction.

All 3 types are available: Firefoam 5F2, for Class A fires (Paper, Wood, Rubbish, etc.) and Class B fires (Flammable Liquids, Gasoline, Oil, Grease, Paint, etc.). Soda-Acid 5S2, for Class A fires, and Water Type 5H2, for Class A fires.

* Label Patent Pending

Tested to 500 Lbs.

ALFCO
TRADE MARK

AMERICAN-LAFRANCE-FOAMITE Corporation
ELMIRA NEW YORK U.S.A.

There's EVERY Size in the BETHLEHEM FAMILY of PUMPING UNITS

It seems that scarcely a year goes by without new oil-field pumping problems, and new demands for additional Bethlehem pumping units. A year ago we were telling you about a little guy called the 16D-5. Now there's one even smaller—the Bethlehem 10D-4, a tiny mite with 10,000-in.-lb torque capacity and load rating of 4700 lb at the polished rod. This beam-balance unit is perfect for water-well service or shallow stripper-well assignments. No longer need you buy oversized equipment for your small pumping jobs.

Of course this smallest machine is but one of many units in the Bethlehem line. It has plenty of bigger brothers in the medium-sized bracket. And if you keep on climbing, you'll finally come to the whoppers—as, for example, the mighty 320.

But even that one isn't the biggest. Now in production and soon to be seen in the field is the family colossus, Bethlehem's 640. This king-size giant is designed to lift oil from wells ranging to two miles in depth. Its long, slow 12-ft stroke has an API rating of 640,000 in.-lb (708,000 in.-lb at nine spm). This slow stroking eliminates gear overloads and excessive rod stress.

Thus Bethlehem offers a unit for every condition of modern pumping—from shallow water wells to deep-down oil strikes. Remember that the next time you add new outfits to your equipment. In the meanwhile, a Bethlehem engineer will gladly furnish complete details whenever you say.

BETHLEHEM SUPPLY COMPANY

General Offices:
21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.

Export Distributor:
Bethlehem Steel Export Corporation
Canadian Representative: Rocky Mountain Supply Co., Ltd., Calgary, Alberta

BETHLEHEM STEEL

In addition to its manufacturing plants and its sales and engineering service, Bethlehem Supply Company maintains stores throughout the Rocky Mountain, Midcontinent, Southwestern, and California oil fields. There are almost 50 of these modern, up-to-the-minute stores, all fully stocked to meet local requirements.

Straight-Line Flow... the economical path from fresh feed to product...

Orthoflow, the new streamlined Fluid catalytic cracker by Kellogg, brings new flexibility and economy to petroleum processing.

In the **Orthoflow** single-vessel units, transmission lines for both catalyst-oil mixture and spent catalyst are fewer, shorter and straight . . . slide-valves and expansion joints are eliminated . . . the catalyst transmission system completely streamlined. Erosion is minimized, maintenance brought to a new low and flexibility of operation retained.

Orthoflow can handle practically any feedstock, from kerosene to the heaviest gas oils. High-boiling stocks are charged as liquids and vaporized by regenerated catalyst with minimum use of preheat facilities.

Orthoflow also permits wide latitude in conversion, recycle, and feed rates.

In this simplified Fluid cracker design, Kellogg engineers have achieved significant savings in original investment. With both reactor and regenerator incorporated into a single vessel, **Orthoflow** saves steelwork, saves on foundations, saves piping . . . and saves thousands of manhours too.

PROGRESS REPORT
ORTHOFLOW CATALYTIC CRACKERS

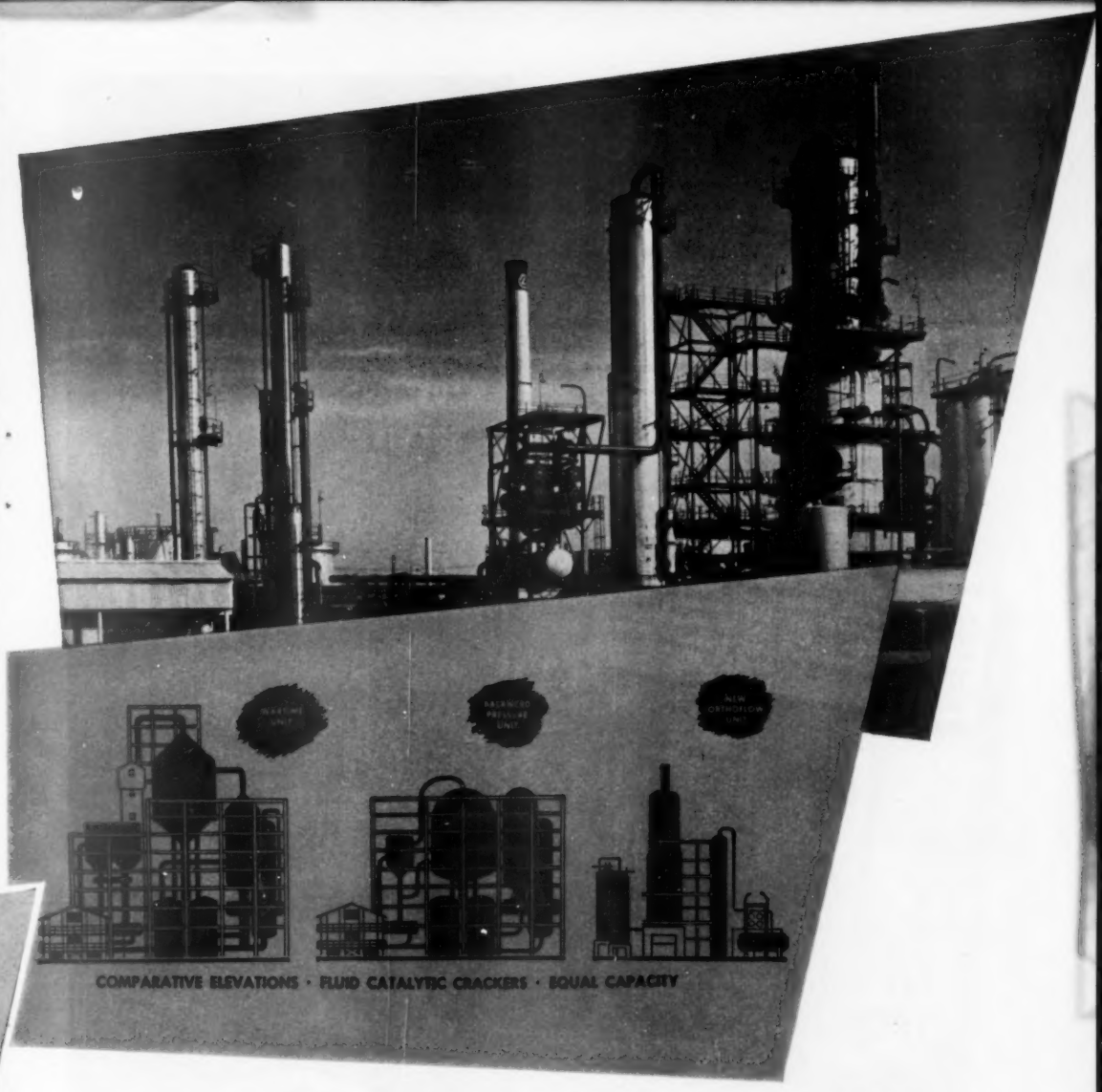
UNITS OPERATING:

In Western Canada—	2,500 BPD Unit
In Mid-Continent U. S.—	8,300 BPD Unit
In Eastern Canada—	8,300 BPD Unit

UNITS UNDER CONSTRUCTION:

On the Atlantic Seaboard—	28,000 BPD Unit
In Mid-Western U. S.—	17,000 BPD Unit
On the Gulf Coast—	26,000 BPD Unit

Kellogg Orthoflow



SIMPLICITY, the outstanding characteristic of **Orthoflow** and the ultimate in any field of design, is the logical outcome of Kellogg experience in Fluid catalytic cracking . . . which dates from the inception of the process and includes the engineering of 70 percent of the world's total fluid capacity. Details of this important new development in Fluid cracking are presented in Kelloggram No. 1—1952 Series "From Baton Rouge to Orthoflow". If you haven't received it, we'll be glad to send a copy on request.

THE M. W. KELLOGG COMPANY

(A Subsidiary of Pullman Incorporated)

NEW YORK JERSEY CITY LOS ANGELES TULSA HOUSTON TORONTO LONDON PARIS

KELLOGG

. . . . . for fifty one years an integral part of petroleum refining progress!

THESE SPEED INCREASERS

have the permanent ruggedness needed for temporary service

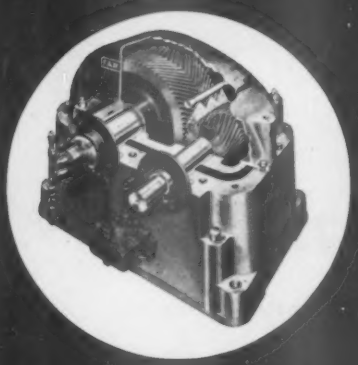
Farrel® speed increasers are ideally suited to withstand the rigors of temporary service such as this. Their inherent ruggedness assures smooth power transmission under the most adverse conditions—continuous day and night operation, dust, rain, sandstorms, severe heat and intense cold.

Features of these units include precision generated gears that operate efficiently through long years of service . . . a completely self-contained circulating oil system that virtually puts power on velvet . . . extra large precision-ground shafts . . . oversize, accurately finished bearings . . . and an exceptionally rigid housing.

Farrel speed increasers are available in 49 standard sizes, with speed ratios ranging from 1:1 to 12:1. For higher ratios, units using two sets of gears are supplied with ratio range from 12:1 to 40:1.

Send for full information. Ask for a copy of Bulletin No. 448A.

Four skid-mounted Caterpillar Diesel engines driving Byron-Jackson pumps through Farrel speed increasers at one of two temporary stations of Interstate Pipeline Company between Sunset, Texas and Baton Rouge, La. Four similar Farrel units are in operation at the other station.



FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, New Orleans

OIL FIELD REPRESENTATIVES:
Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Okla.
V. W. Osborne, 860-A M&M Bldg., Houston 2, Texas

Farrel-Birmingham®

FB-731

North American

. . . and the big transportation job!

North American is working tirelessly these busy days keeping every tank car moving full time. It's our way of minimizing the current tank car shortage, of meeting the increased shipping needs of the expanding petroleum industry. Whenever there's a big transportation job to be done, you'll always find North American cars on hand to the limit of availability. You can depend on that.

For Special Products Requiring Special Care

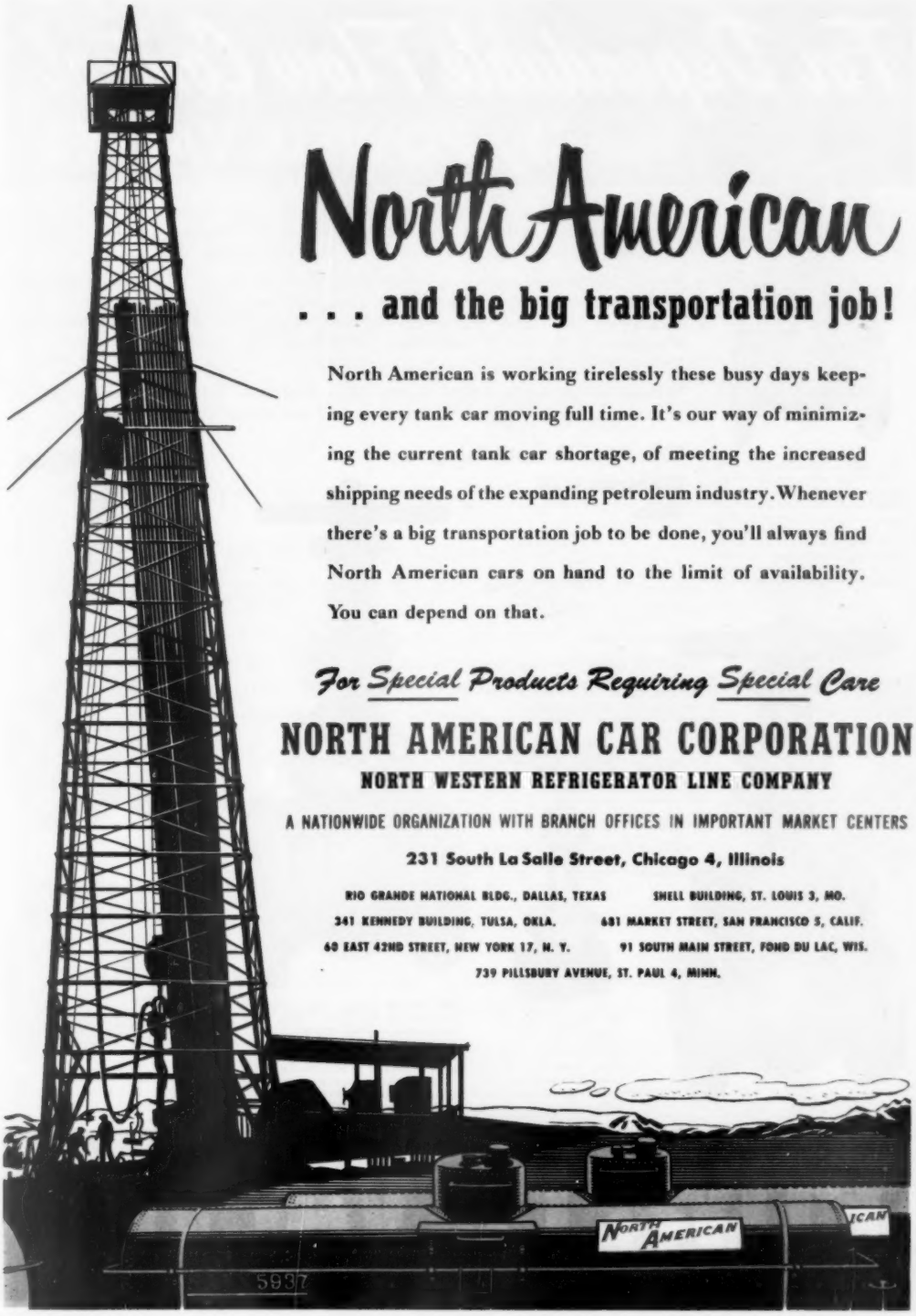
NORTH AMERICAN CAR CORPORATION

NORTH WESTERN REFRIGERATOR LINE COMPANY

A NATIONWIDE ORGANIZATION WITH BRANCH OFFICES IN IMPORTANT MARKET CENTERS

231 South La Salle Street, Chicago 4, Illinois

RIO GRANDE NATIONAL BLDG., DALLAS, TEXAS — SHELL BUILDING, ST. LOUIS 3, MO.
341 KENNEDY BUILDING, TULSA, OKLA. — 681 MARKET STREET, SAN FRANCISCO 5, CALIF.
60 EAST 42ND STREET, NEW YORK 17, N. Y. — 91 SOUTH MAIN STREET, FOND DU LAC, WIS.
739 PILLSBURY AVENUE, ST. PAUL 4, MINN.



For Dependable Flow Control
Specify POWELL VALVES

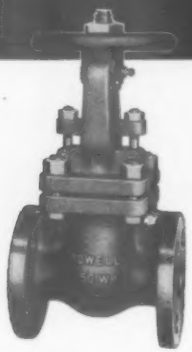


Fig. 2491—150-pound O. S. & Y. Gate Valve with precision-fitted, quickly interchangeable, solid or split wedge. Stem is threaded and guided through revolving bushing in upper yoke, which has a compression lubricant fitting. Available in a wide variety of corrosion resisting metals and alloys. Also made with screwed ends.

The amazing growth of the Oil Industry—not only in volume produced, but in the development of innumerable new petroleum products—has created a tremendous demand for all kinds of valves.

Powell, with extensive manufacturing facilities and an enviable background of making *dependable* valves, has met this issue squarely by supplying the right valves—both stock and special designs—to handle the flow of fluids in petroleum refineries and petro-chemical plants throughout the country.

Wherever oil, water, gas, steam or a corrosive fluid must be piped, there's a Powell Valve to control it to your complete satisfaction.

The Wm. Powell Company
Cincinnati 22
Ohio

DEPENDABLE VALVES SINCE 1846

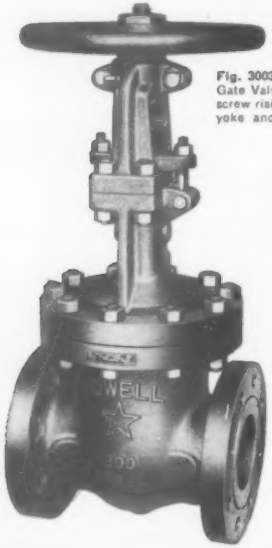


Fig. 3003—300-pound Cast Steel Gate Valve. Flange ends outside screw rising stem, bolted flanged yoke and tapered solid wedge.

Fig. 375—200-pound Bronze Gate Valve. Screwed ends, union bonnet, inside screw rising stem and renewable "Powellium" wear-resisting nickel-bronze disc.

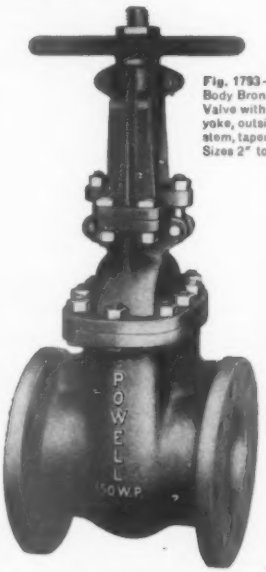


Fig. 2453-G.—Large size 150-pound Stainless Steel O. S. & Y. Gate Valve with precision-fitted, accurately guided solid or split wedge. These are interchangeable. Made with separable yoke arms in sizes 5" to 30", incl. Conforms to all the latest standards. Available in a wide selection of other corrosion-resisting metals and alloys.

Fig. 1793—125-pound Iron Body Bronze Mounted Gate Valve with bolted flanged yoke, outside screw rising stem, tapered solid wedge. Sizes 2" to 30", inclusive.

Fig. 1561—150-pound Cast Steel Swing Check Valve with flanged ends and bolted cap.

POWELL VALVES

In Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys.

ATTAPULGUS Fullers Earth
POROCEL Activated Bauxites

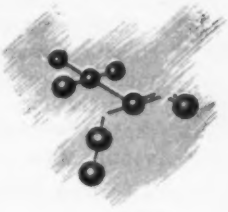
...two reliable names along the path of petroleum processing

WHAT DO YOU WANT TO PURIFY?

There's an Attapulgus or Porocel adsorbent to fit your process technique for removing odors, colors, tastes, moisture, acids, sulfur, fluorides and unsaturates from process liquids or gases. Materials treated in principal applications are: motor oils and other lubricating, specialty, and technical oils; petrolatums and waxes; aviation and motor gasoline stocks; kerosene; diesel and heating oils.

DO YOU HAVE CATALYST OR CATALYST CARRIER NEEDS?

Attapulgus or Porocel sorptive minerals are recognized standards in desulfurization, reforming and isomerization systems—catalytic removal of unsaturates—conversion of sulfides to elemental sulfur—fluid catalyst applications—as catalyst carrier in copper sweetening processes.



WHAT DO YOU WANT TO DRY?

We offer a wide range of reliable, thoroughly proved desiccants for drying air, hydrogen, carbon dioxide, hydrocarbon liquids and gases.

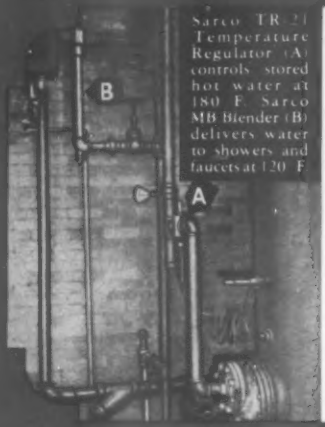
SPECIAL GRADES?

Mine and plant facilities permit prompt and economical production of grades meeting individual customer specifications. Our laboratories and technical staffs welcome the opportunity of assisting in research, development, design and operating problems. Your inquiries are invited.

ATTAPULGUS CLAY COMPANY *Fullers Earth* · **POROCEL CORPORATION** *Activated Bauxites*

Dept. V, 210 West Washington Square, Philadelphia 5, Pa.

Don't Waste It



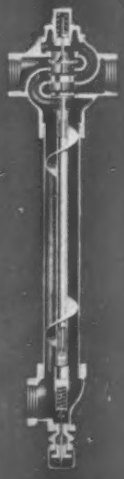
Sarco TR-21 Temperature Regulator (A) controls stored hot water at 180 F. Sarco MB Blender (B) delivers water to showers and faucets at 120 F.

In most plants and institutions hot water is stored for periodic use in process work, gang showers, group wash basins, etc.

Much of this water (often carried at 180 or 200° F) is wasted by allowing manual temperature adjustment at the point of use.

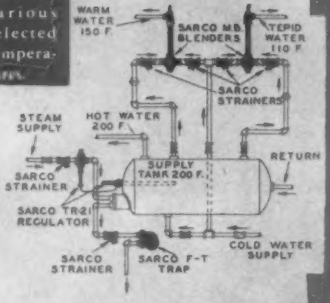
Avoid buying additional Water Heater capacity by installing Sarco Water Blenders.

Blend It



Sarco Water Blender type MB provides tempered water at any desired constant temperature.

Hot water control system for various selected temperatures.



They add cold water to the hot from the storage heaters to secure the exact temperature desired at the point of use. In effect, storage capacity will be increased by preventing waste.

Catalog 802 tells the whole story.

Write for free copy today.

SARCO COMPANY, INC.
Empire State Building, New York 1, N. Y.
Represented in Principal Cities
Sarco Canada Ltd., Toronto 5, Ontario

Sarco Water Blenders

DUNN BROS., INC.
DALLAS, TEXAS

STRINGS 3 MILES OF 30"– DAILY

Through Tough Texas Terrain!

"When it comes to stringing pipe cross-country, we like the yellow paint of Trackson-'Caterpillar' teams." That's the feeling of Cliff Hammett, Foreman on Dunn Bros., Inc., stringing crew working in Eastern Texas. And performance on the contract shows why.

A Trackson PIPE LAYER on a D7 is stringing 30" pipe at the rate of 3 miles a day — over the sandy soils and tangled bogs of East Texas. The MD7 PIPE LAYER has a 23-foot boom to speed handling of the 4600-pound loads.

You, too, will go for Trackson-"Caterpillar" teams once you see how they get more work done at lower cost . . . on many more jobs. Ask your "Caterpillar" Dealer for details on the PIPE LAYER model that can handle your stringing, doping, wrapping or laying needs . . . or write direct.

CATERPILLAR TRACTOR CO., Peoria, Illinois

TRACKSON
REG. U. S. PAT. OFF.

A SUBSIDIARY OF CATERPILLAR

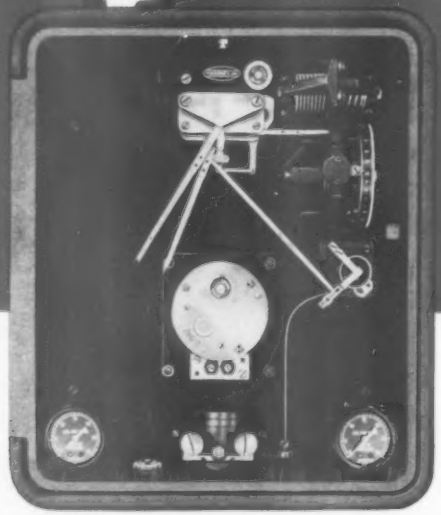
TRAXCAVATOR SHOVELS
PIPE LAYERS
TRACLOADERS
ANGLEFILLERS

So You Want to Buy a

Of course you'll compare the various models offered. You will note that:—

All have the same basic components . . .
primary element, proportioning mechanism, pilot.

All operate on same basic principle . . .
measure changes in controlled variable, apply corrective measures by regulating an output pressure.



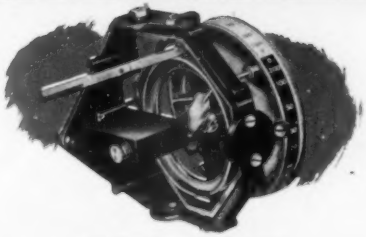
A HIGH Quality Coefficient PRODUCT

BUT HERE THE DIFFERENCES BEGIN

differences that are important to the instrument man and operator: differences in design and arrangement which result in great variations in simplicity, versatility, reliability and ease of adjustment and servicing.

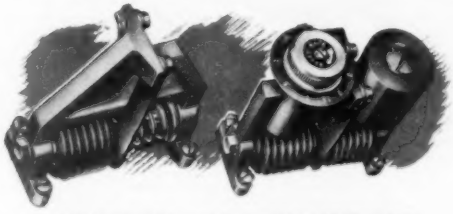
For example, note how refinements in design make the Masoneilan 60000 Series Controller outstandingly different from most other types —

Pneumatic Controller!



THE GIMBAL UNIT...

the heart of the mechanism which regulates the flow of power from the controller — selects *four* combinations of primary and feedback motion to provide proportional, differential-gap and on-off control with direct or reverse action — makes this controller more versatile than any other. The proportional band wheel, by one simple adjustment, selects the *type* of control, the *action* and the proportional band or differential-gap *setting*.

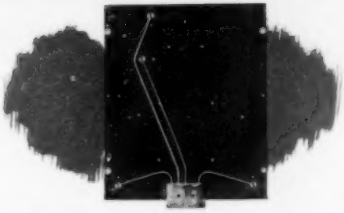


INDIVIDUAL, INTERCHANGEABLE SUBASSEMBLIES...

without linkage complexities, provide for (a) addition of standard subassemblies *easily*, to obtain pneumatic set, time schedule, differential control; (b) *easy* interchange of standard proportional and proportional-rest units; (c) ease of servicing because each sub-assembly is *individually* accessible.

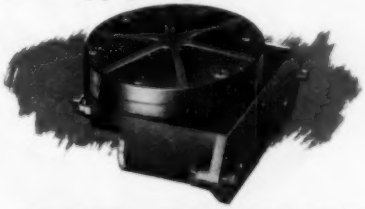
EASE OF ADJUSTMENT...

provided by accessibility without removing chart; by large knobs and large diameter proportional band wheel; by easily read graduated scales.



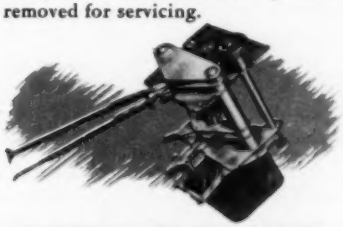
MANIFOLDING OF ALL AIR PASSAGES

with plug-in connections (a) aids accessibility, (b) eliminates pressure fittings, (c) permits interchange of components or addition of manual control subpanel *without piping changes.*



BALANCED, AMPLIFYING PILOT...

insures maximum capacity and stability in flow of output pressure. Includes latest refinements such as plunger-cleaned sapphire restriction, filters in outlet and inlet ports, frictionless floating valve action. Easily removed for servicing.



MULTIPLE PEN MOVEMENT...

provides common axis of rotation for pens and index, ball pivots, index setting by manual or automatic (e.g., Pneumatic Set, Time Schedule, etc.) adjustment.

With accurate, stable performance plus unmatched simplicity, versatility and reliability — the Masoneilan 60000 Series Controller is truly the Instrument Man's Instrument for pressure, temperature, liquid level or flow control.

MASON-NEILAN REGULATOR CO.

1185 ADAMS STREET, MASONEILAN **BOSTON 24, MASS., U. S. A.**

Sales Offices or Distributors in the Following Cities:
New York • Syracuse • Chicago • St. Louis
Tulsa • Philadelphia • Houston • Pittsburgh
Birmingham • Atlanta • Cleveland • Cincinnati
Detroit • San Francisco • Salt Lake City • El Paso • Boise • Albuquerque • Charlotte • Los Angeles • Denver
Appleton • Corpus Christi • New Orleans • Louisville • Mason-Neilan Regulator Co., Ltd., Montreal and Toronto

...WITH Harco CATHODIC PROTECTION SYSTEMS

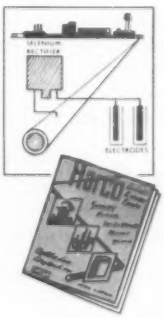
Costly, wasteful corrosion can be stopped! **HARCO** can design and install a cathodic protection system engineered specifically for your piping installation . . . *and only such a job-engineered system can give you complete corrosion protection.*

Factors which must be considered include soil and water chemical characteristics, soil conductivity and moisture content, temperature, seasonal variations of environment, protective coatings, dissimilar metals, position of other metallic structures and presence of stray currents.

HARCO engineered corrosion control systems result in greatly extended pipe life, lower maintenance and replacement costs, reduction of "down-time" and protection from hazards caused by electrolytic corrosion.

★ ★ ★

Write **HARCO** today for catalog containing information on cathodic protection systems or *call MOntrose 2-2080.*



609-HC

THE Harco CORPORATION Cathodic Protection Division

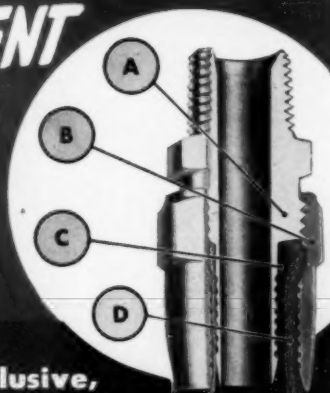
Offices in Principal Cities

16961 BROADWAY • CLEVELAND, OHIO

OIL-FIELD EQUIPMENT

stays "on the job" SAFELY, DEPENDABLY,

. . . when you use Anchor Exclusive, Patented Reusable Couplings and Hose



HOW IT WORKS

The thread on the body of the insert (A) and on the shell (B) is correctly designed to insure positive engagement and help prevent stripping. Anchor's exclusive patented grip provides additional packing of the hose in recess (C) and a uniform compression area (D).

All the things you want most in LPG, oil, air, and water hose assemblies — safety, dependability, easy assembly, neat appearance, lower inventories — are yours with Anchor 2-piece reusable couplings. Oil-field equipment manufacturers and users know that Anchor Couplings prove themselves under the most rugged field conditions. Anchor's exclusive patented design means money, time, and trouble saved for you, too. Look at these distinctive features:

EASY, FAST ASSEMBLY. The only tools needed to assemble couplings and hose are a wrench, an oil can, and a vise. It's that simple! Couplings can be used over and over again.

SAFER, MORE DEPENDABLE. Anchor's exclusive patented grip *keeps* hose assemblies performing *dependably* day-in, and day-out without attention — prevents leaks and dangerous blow-offs.

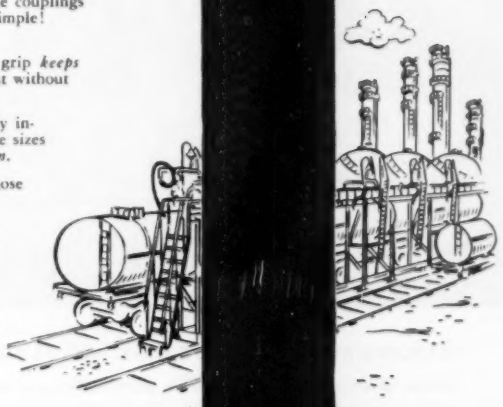
LOWER INVENTORIES. Costly prefabricated hose assembly inventories are eliminated. Just carry one coil of hose in the sizes you use. Cut it to lengths you need *when you need them.*

LESS DOWNTIME. Costly downtime in the field is cut. If hose assembly servicing is required, it can be performed immediately *without special tools.*

STREAMLINED DESIGN. Your jobs are neat and efficient, even in tight corners.

All the advantages in the most complete line of hydraulic hose assemblies and fittings available are yours with Anchor — advantages that mean your hose assemblies last longer, perform better, handle easier. So specify Anchor. Send coupon for further information.

ANCHOR



NEW FACTORY BRANCH!
at 2100 Irving Blvd. Dallas, Texas.
Especially stocked for oil-field users. Fast, efficient service.

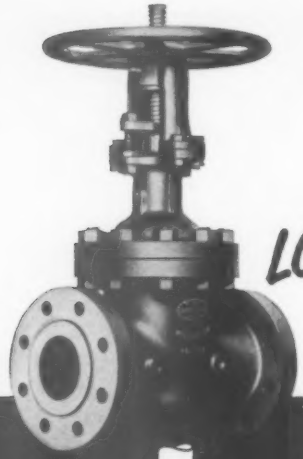
Attach coupon to your letterhead and mail today!

ANCHOR COUPLING CO. Inc.
FACTORY: Libertyville, Ill. ● BRANCHES: Detroit, Mich., Dallas, Tex.

ANCHOR COUPLING CO. INC.
Dept. OG-72, Libertyville, Illinois

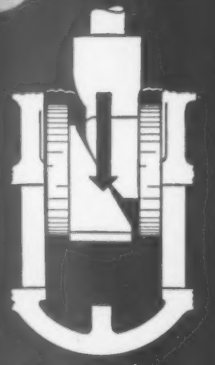
I'm interested in Anchor 2-piece reusable Couplings. Send me further information.

NAME ..... TITLE .....
COMPANY NAME .....
COMPANY ADDRESS .....
CITY ..... (. . .) STATE .....

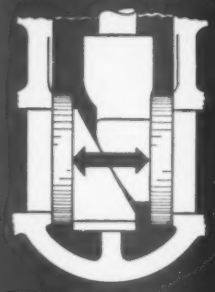


Look how you gain LONGER, TROUBLE-FREE VALVE LIFE

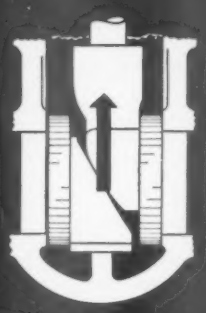
with Darling revolving disc gate valves*



DESCENDING. Fully revolving discs, independently hung, change seating position at each closing, assuring uniform wear distribution for prolonged service. Plain "no pocket" discs are interchangeable for *extra* life!



CLOSED. Faces of upper wedge are radiused and faces of both wedges are transversely beveled for equalized wedging pressure and *tight closing despite valve body distortion.*



RISING. Wedging pressure on both discs is released before discs start to rise. Complete absence of wedging pressure during travel of discs assures easy operation, tight closing and greatly prolonged valve life!

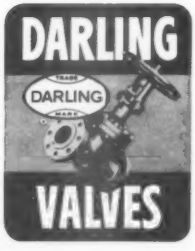
***DARLING REVOLVING DISC GATE VALVES FOR EVERY NEED . . .**

These unique valves are available in iron, bronze, steel, special corrosion-resistant alloys and combinations, and in a broad range of sizes, for all kinds of normal and unusual services in pressures up to 1500 pounds. Before you buy gate valves of *any* type, find out what you stand to gain by using the proper Darling valves. Simply outline your service requirements and ask for a free, descriptive bulletin.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario.



FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

FOR WELDING OR CUTTING

CHECK THESE "800" HIGHLIGHTS YOURSELF . . .

- **EXCEPTIONAL VERSATILITY** . . . from welding and cutting to descaling and flame cleaning, hardening, and hardfacing.
- **WIDE TIP RANGE** . . . long flame or bulbous up to size 10. In separable swaged tips — up to size 13.
- **LOWER OPERATOR FATIGUE** . . . 10 inches long; 21 ounce weight; planned balance minimizes operator fatigue.
- **FOR METAL CUTTING, TOO** . . . quickly converted for cutting either thin sheets or heavy plate up to 3-6" thick.

Ask for Catalog 2, Hand Torches for Welding and Cutting.

The Airco No. 800 Torch — with a wider welding range than any other torch on the market — is ready for any job from fine sheet work to heavy sections. A wide selection of tips permits unusual weld-and-cut versatility . . . while rugged construction makes it a natural for "rough and tumble" shop and field work.

AND . . . the Airco 8400 series two-stage regulator is your guarantee of constant gas pressure. One pressure setting needs no further attention. Saves time, gas, with trouble-free operation — gives better flame performance in welding and cutting. Ask for Catalog 5, Regulators.

SUPPLIES, TOO . . . Airco maintains a full line to complete the team for all around welding, cutting and hardfacing. Write for further information on welding rods (Catalog 12) . . . electrodes (Catalog 10) . . . as well as hardfacing alloys (Catalog 11) . . . and accessories, (Catalog 13).

AN AIR REDUCTION PRODUCT

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

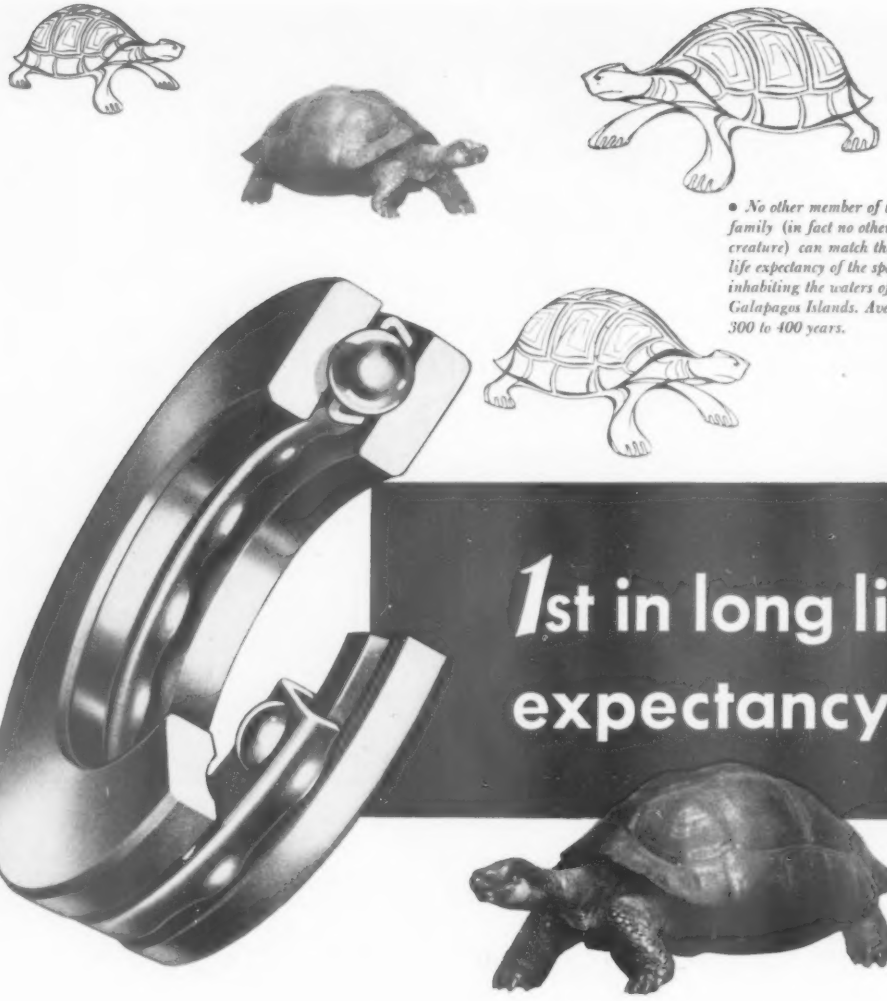
AIRCO®

AIR REDUCTION MAGNOLIA COMPANY

A Division of Air Reduction Company, Incorporated

Beaumont • Corpus Christi • Dallas • El Paso • Fort Worth • Hobbs
Houston • Oklahoma City • San Antonio • Shreveport • Tulsa • Wichita Falls

Southwestern Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories



• *No other member of the turtle family (in fact no other living creature) can match the life expectancy of the species inhabiting the waters of the Galapagos Islands. Average life: 300 to 400 years.*

1st in long life expectancy

In the field of bearings, too, looks can be misleading. Don't buy them on the principle that "look-alikes" must necessarily "last-alike."

Safer way is to look for the name AETNA on the bearings you buy for replacement in the equipment you use—to specify AETNAS when blueprinting a brighter future for the equipment you make. Indicative of their quality and lasting serviceability is the fact that 80% of our business comes from firms we have served for 20 or more of our 36 years.

Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings

AETNA BALL AND ROLLER BEARING COMPANY
4600 Schubert Avenue • Chicago 39, Illinois

You'll save time and trouble on H.P. VESSEL GASKETS

...when J-M Goetze gasket specialists make them for you

When you need gaskets such as those above, which were made for pressure vessel service over 5000 psi, consider this. It takes less time and trouble to turn the job over to J-M Goetze —an organization that has specialized in gasket design and manufacture for 67 years. And it usually costs less in the long run.

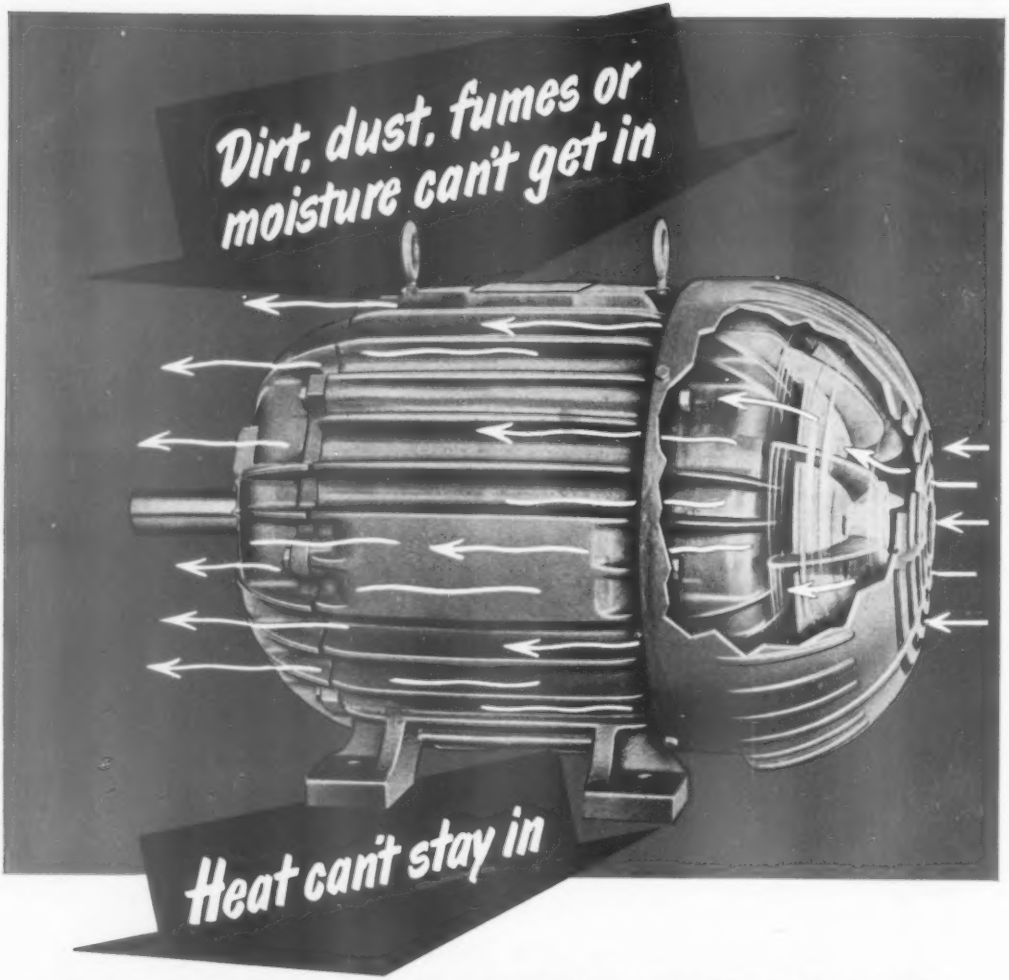
Goetze engineers can select the right style for maximum sealing efficiency. They know the correct metals and other factors required for efficient, long-lasting gaskets.

Goetze Gaskets are made exactly to the last detail of your specifications and conditions. They are made to craftsmen's perfection . . . with modern machine tools, some of which were specially designed by Goetze for gasket manufacture.

If you need gaskets for high pressure vessels or similar applications, send us a drawing or template for quotation. Or write for further information to Johns-Manville, Box 60, New York 16, New York.

Johns-Manville Goetze GASKETS

THERE'S A JOHNS-MANVILLE PACKING AND GASKET FOR EVERY SERVICE



ELLIOTT CROCKER-WHEELER
Sealedpower MOTOR

Here's a motor that doesn't care how tough the conditions are. Blizzards of dust or grit can't affect it—not only can't get *in*, but can't even stay *on* the outer case. The powerful fan-driven, cowl-directed air blast sweeps it off, and also drives off the heat radiated from the many fins.

Easy to see why this Sealedpower motor has for **eleven years** been the ace-in-the-hole among engineers who are confronted with drive conditions that would defeat ordinary motors.

Thousands now in service, and going strong in oil refineries, lumber mills, chemical and textile plants, outdoor and indoor installations everywhere. 3 to 125 hp. Also as explosion-proof underwriters approved in most ratings. Get the facts. Address Elliott Company, Jeannette, Pa., or your nearest Elliott district office.

ELLIOTT COMPANY
Crocker-Wheeler Division
AMPERE, N. J.

For large motors: RIDGWAY DIV., RIDGWAY, PA.
Plants at: JEANNETTE, PA. • RIDGWAY, PA. AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES
ELLIOTT APPROVED SERVICE SHOPS COVER THE COUNTRY

W2-8

AHEAD OF THE MUD PUMP

First there's financing by the FIRST in Dallas

THE SOUTHWEST'S PIONEER OIL BANK

FIRST NATIONAL BANK IN DALLAS

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Give us an opportunity to say YES

1 man....

1 minute....

1 mobile unit....

.... and the fire's out!

That's right. It takes one man just one minute at the nozzle of this latest model *Kidde* Wheeled Extinguisher to discharge all of 150 pounds of fire-choking dry chemical. And, Mister, 150 pounds of dry chemical can snuff out a mighty big fire.

Kidde's "instant flow" nozzle and adjustable hand control means you can beat back fire with a 30-foot-range "straight stream" or blanket it with an improved "fan" pattern.

If you want really powerful protection against exceptionally large fires in live electrical equipment, flammable liquids, textiles, etc., you want a *Kidde* 150 pound Dry Chemical Wheeled Extinguisher. Write today for full information.

Kidde

Walter Kidde & Company, Inc.

755 Main Street, Belleville 9, N. J.

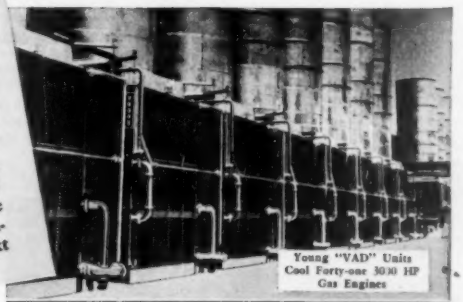
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc. and its associated companies.

YOUNG

SELECTED FOR COOLING ONE OF THE WORLD'S LARGEST INTERNAL COMBUSTION PLANTS

Reynolds Metals Company's new aluminum reduction plant at San Patricio, Texas, has been proclaimed one of the world's largest and finest internal combustion installations. Here 83 natural gas driven Diesel engines generate 278,400 HP, and develop a total of 543,000,000 BTU per hr., which must be dissipated. Young's heat transfer organization . . . with completely integrated facilities for the design, development, manufacture, testing, rating, and installation servicing of specialized heat transfer equipment was commissioned to handle the cooling job. 83 rugged, compact, thermostatically controlled units, for cooling the Engine Jacket Water and Lube Oil, plus 84 Supercharger Air Intercoolers for increasing both horsepower and efficiency of engines, were delivered by Young. Certified Ratings and more than a quarter century of proved performance in the field assure complete satisfaction. Take advantage of this experience . . . specify that your next job is Young-engineered.



Young "VAD" Units
Cool Forty-one 3030 HP
Gas Engines

Young "HC" Units
Cool 42 Cooper-Bessemer
3700 HP Gas Engines

1927 • 1952
25 YEARS OF PROGRESS

YOUNG

Heat Transfer Products for Industrial and Automotive Applications.

Cooling, Heating, Air Conditioning Products for Industry and Home.

YOUNG RADIATOR COMPANY

Dept. 282-G • RACINE, WISCONSIN
Factories at Racine, Wisconsin and Mattoon, Illinois

On the plains of Texas
In the hills of Pennsylvania

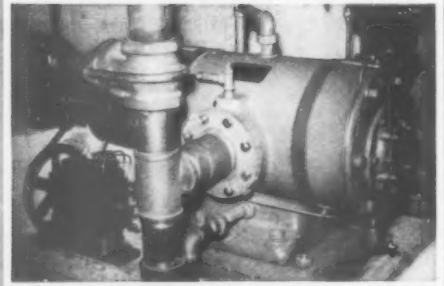
FULLER ROTARY COMPRESSORS

Fuller Rotary Compressors, in the refinery for general plant air, purging gas, refrigeration in alkalization units, and handling butane-butylene, as well as in the field for pressure boosting and gas gathering, have proved their worth, as is evidenced by the many machines in daily use in practically every oil-producing section of the country.

The ability of Fuller Rotaries to perform, day in and day out, with minimum attention, supervision, and maintenance, has *earned* for them a well deserved position in the oil fields. Particularly adapted to handling of weak wells, and the volume demanded, without creating a serious maintenance and supervision problem, they have proved to be an economic and practical answer for many producers.

Simplicity of construction has proved to be one of the important factors . . . the only moving parts being the rotor, bearings, blades. No valves to leak; no seats to grind, *giving full boosting capacity for the life of the machine.* A simplified direct drive eliminates power transmission losses.

Fuller Rotary Compressors are available in a range of cylinder combinations up to 3300 c.f.m. (at atmospheric intake) at normal speeds, with a reasonable variation in speed range—motor, engine or turbine drive.

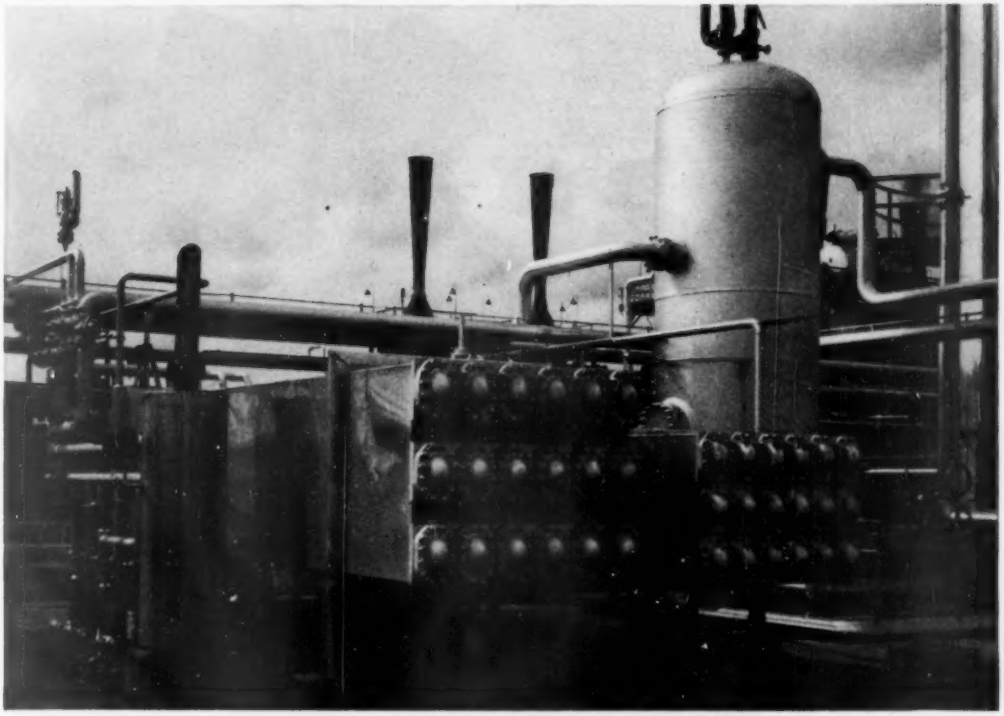


FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St., Chicago 3
420 Chancery Bldg., San Francisco 4

Write for Bulletin C-6

C-227

Fuller PIONEERS OF HIGH-EFFICIENCY VANE-TYPE ROTARY COMPRESSORS



Designed by Delta Engineering Corporation, Houston. Insulation Contractor: Thermal Products Company, Houston.

Here's the last word in *lasting* insulation for this modern gasoline plant

● Inside those smooth aluminum jackets, you'll find the last word in modern, long-life insulation. Rigid blocks of all-glass FOAMGLAS prevent heat loss on vessels and heat-exchangers at this new gasoline plant operated by J. S. Abercrombie Company for the Old Ocean Unit.

They picked FOAMGLAS because it was expected to outlast any other insulation. Even without a protective coating of any kind, FOAMGLAS will not absorb water. It will not transmit vapor. Therefore the insulation value of FOAMGLAS remains constant over the years.

Every block of FOAMGLAS is a single piece of true inorganic glass containing millions of tiny air bubbles . . . there are no sealers or binders of any kind. FOAMGLAS is *all-glass;* that's why it has such phenomenal resistance to moisture and chemical attack. You can get FOAMGLAS in different sizes to meet your industrial insulation needs.

Send the coupon for free sample of FOAMGLAS and copy of our latest booklet.

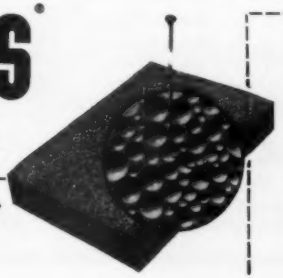
PITTSBURGH CORNING CORPORATION · PITTSBURGH 22, PA.

PITTSBURGH PC CORNING

FOAMGLAS®

the cellular glass insulation

The *best* glass insulation is cellular glass. The only cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, verminproof. It has unusually high resistance to moisture, chemicals and many other elements that cause insulation to deteriorate.



Pittsburgh Corning Corporation
Dept. DD-72, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me, without obligation, a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

Name.....

Address.....

City.....State.....

CORROSION which results from chemical or electrochemical reaction between a metal and its environment may lead to serious loss of metal, to fracture and to deposits. Corrosion deposits are usually precipitated on or near the corroded area. In certain instances, however, they may be deposited a considerable distance from the point at which the metal is undergoing attack . . . (*Ref. ASTM D 1129-51*).

Use DREW POWER CHEMICALS

Corrosion may be active in your boiler water system now—ready to cause expensive trouble in boilers, steam and condensate lines. Serious deposits may result from corrosion. It's time now to inspect your boiler system thoroughly, to avoid inconvenience—even plant shutdown.

So, draw a bead on boiler system corrosion, Mr. Engineer. Call for the Drew Power Chemicals Engineer. The water samples and operating data he obtains in your plant will be thoroughly analyzed in the Drew Laboratories. You'll be given specific recommendations for corrective or preventive treatment. Furthermore, your Drew Engineer will give you frequent and continuous help in your plant.

Thorough investigation, proper treatment and frequent service have made Drew one of America's fastest growing water treatment companies. Consult the nearest Drew Engineer, or write for information.

Power Chemicals Division

E. F. DREW & CO., INC.

15 East 26th Street, New York 10, N. Y.

AJAX, ONTARIO

SAN FRANCISCO CHICAGO PHILADELPHIA BOSTON DALLAS

Service throughout the United States, Canada and South America

DREW PRODUCTS

Isn't it logical?

First, Hill, Hubbell cleans the pipe to bare bright metal by Roto-Grit Blast. Then, temperature of pipe and coating and wrapping materials is precisely controlled at every step of the process.

Isn't it logical that factory-coated pipe should last longer? As a final precaution, every length of pipe protected by Hill, Hubbell is inspected with electronic holiday detectors before leaving the factory.

Hill, Hubbell and Company

Division of GENERAL PAINT CORPORATION

Headquarters: 3091 Mayfield Road, Cleveland 18, Ohio

Leaders in Pipe Protection for a Quarter Century

PLANTS

Lorain, Ohio; Youngstown (at Girard, Ohio); Chicago Area—Hammond, Indiana (Gibson Yard) ★

★ Railroad in transit privileges

HEXTEEL in a hurry! Here a shipment goes via World Airlines TWA, destined for an overseas customer.

KLEMP

World's Largest Manufacturer of Open Steel Meshes

The Klemp Metal Grating Corporation has shipped its open steel and aluminum grating and treads, ganister lining reinforcement meshes, and open steel and aluminum bridge deckings to the leaders of industry, construction and commerce in the four corners of the world for almost half a century.

Send for our new Petroleum Catalog! See how we meet the needs of the world's major oil companies by fabricating the following products to our customers exact specifications:

KLEMP HEXTEEL® AND FLOORSTEEL®
for reinforcement of ganister linings.

KLEMP-KREST* GRATINGS AND TREADS
KLEMP DIAMOND RIVETED GRATING
KLEMP SERRATED GRATING AND TREADS
for catwalks, stair treads, runways, and tower stairs.

Our specialized experience in solving difficult grating problems and pipe and vessel lining problems is at your service. Send in your blueprints for quotations today! All types of Klemp gratings are available for immediate delivery.

Write for Klemp's new free, fully illustrated, technical catalog entitled, KLEMP 4 "GRATES" Serving the Nation's Major Oil Companies.

KLEMP METAL GRATING CORPORATION
Executive Office: 1361 North Branch Street, Chicago 22, Illinois
Plants and Warehouses at Chicago, Illinois, and Houston, Texas

*Trademark

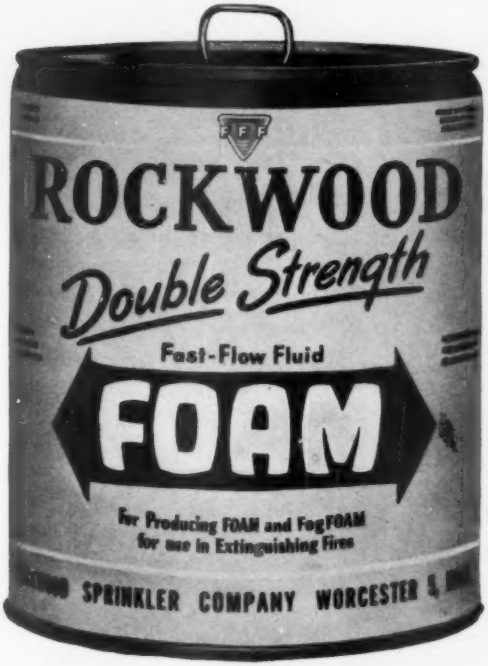
Quenches Quicker!

. . . with Less Water

that's the Short-Short Story of Rockwood Fire Fighting Aids

That's why fire-fighters like to work with Rockwood's equipment. Take for instance our new contribution to modern fire fighting, the Rockwood Double Strength FOAM Liquid which has many important advantages. Three of these are:

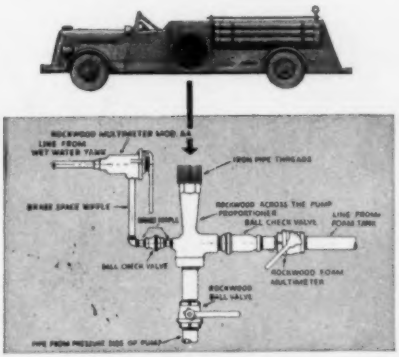
- 1. more fluid
- 2. faster spreading
- 3. flows freely at sub-zero temperatures



Rockwood's new Double Strength FOAM Liquid will put out fires in flammable liquids faster and at lower cost. Three parts of FOAM liquid mixed with 97 parts of water form an excellent foam blanket that will quickly re-seal if broken. Double Strength FOAM Liquid is more fluid, faster spreading and flows freely at sub-zero temperatures (−15° F.) It is quicker to put into action, covers burning surfaces faster, seals off combustible vapors completely and flows freely around obstructions. This foam blanket has proved its ability to extinguish large spill fires in gasoline with maximum speed and safety to firemen.

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses



Accurate Mixing Assured: Automatically feeding Double Strength Foam or Wet Liquid into hose lines, Rockwood's Model Dual "B" Around-the-Pump Proportioner is designed for use where pressure is maintained by a pump from either draft supply or booster tank. Multimeter settings admit proper amounts of wetting agent for varying nozzle discharges and solution strengths.

Special Fire Truck Proportioning Systems for FOAM Liquid and Wetting Agents

Trucks for crash-rescue fire fighting, at airports or for handling spill fires in an oil refinery require special proportioning systems for large volume FOAM discharge through several FOAM turret and hand line nozzles.

Custom engineered proportioning systems to meet these and other unusual requirements are a Rockwood specialty. If you have such hazards let us engineer a proportioning system to fill your needs.

SEND FOR THIS ILLUSTRATED CATALOG

ROCKWOOD SPRINKLER COMPANY
104 HARLOW STREET, WORCESTER 5, MASS.

Please send me Rockwood's illustrated catalog on the complete line of cost cutting, efficiency-boosting products for modern fire fighting.

Name_____

Title_____

Company_____

Street_____

City_____

Zone_____ State_____

GENERAL SHERMAN, WORLD'S LARGEST TREE

GASO World's Best Known Portable Pumps

Specifications of the General Sherman Bigtree, Sequoia National Park: Diameter, 36½ feet. Circumference, nearly 115 feet. Height, 272.4 feet. Lumber content: 600,-120 board feet. Age 3000 to 4000 years.

We confess that no Gaso Pump has yet attained the age of the Bigtree. But we can point to many of our earliest models still doing their daily stint, with a history of economical performance that would be unbelievable were it not backed up by accurate cost records.

That's what cost-conscious buyers look for in pumping units—completely dependable service at minimum cost. And that's what makes GASO PUMPS predominantly first in the favor of pipeline men.

SIX FOOT MAN ON SAME SCALE AS TREE

GASO PUMP & BURNER MFG. CO. 902 EAST FIRST ST., TULSA, OKLA.
EXPORT OFFICE: 149 BROADWAY, NEW YORK

Shreveport: W. L. SUMNER CO., 419 Lake Street · Los Angeles: 2329 Chambers St., Vernon · Western Canada: Lufkin Machine Co., Ltd., Edmonton, Alberta

GASO PUMPS

for every oil industry need

ENGINEERING News

Jet Blowers Provide Efficient Method For Ventilating Tanks and Towers

When it becomes necessary to shut-down and enter storage tanks or fractionating towers to clean or repair these units, adequate ventilation must be provided.

SK Steam Jet Blowers are ideal for this purpose.

When connected to a tank or tower, the jet blower will create a suction and will draw out the vapors in the manner shown in Fig. 402-C.

Either steam or compressed air can be used to operate the blower. As shown in the sectional drawing, the steam or air issues from the nozzle of the blower at high velocity, entrains large volumes of vapor in several stages, and discharges outside the tank or tower.

By continuing to operate the blower, continuous circulation of fresh air within the tank can be accomplished.

SK Steam Jet Blowers are pictured and described in detail in Bulletin 4-AB. If interested, send for a copy.

Fig. 402-C. SK Steam Jet Blower connected to Low Pressure Storage Tank for Providing Ventilation.

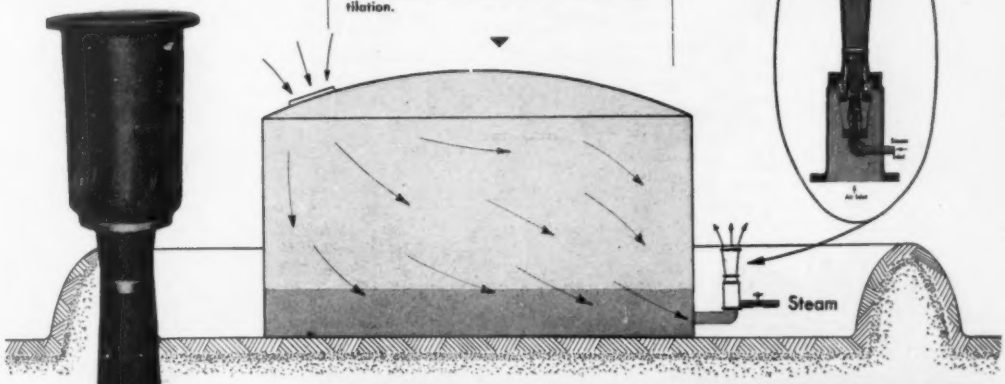


Fig. 402. SK Steam Jet Blower.

BULLETIN DESCRIBES MANY TYPES OF SK ROTAMETERS

Bulletin 18-RA, a four-page folder, pictures and describes briefly the various types of Rotameters and Flow Indicators manufactured by the company. Specifically designed to assist engineers in determining the type meter best suited for individual requirements, the folder indicates the principal applications for which each instrument is designed, lists the available sizes, and refers, by number, to the bulletin in which complete details are given. Copies of Bulletin 18-RA are available upon request.

SCHUTTE and KOERTING Company
Manufacturing Engineers

a Completely New Type

★ *Progress Report to Oil Field Tractor Users*

NEW DESIGN MAKES DOZER PART OF TRACTOR

Allis-Chalmers HD-9 Tractor and No Push-Beam Dozer

A GREAT NEW TRACTOR. This new Allis-Chalmers HD-9 Tractor has power, weight and balance that puts it in a class by itself — never such traction . . . such pushing and pulling ability.

A REVOLUTIONARY TEAM. Here is a tractor-dozer combination designed together as a unit, which compares in performance with conventional "dozers" weighing from five to six thousand pounds more.

NO PUSH BEAMS. The 9X blade is mounted directly to the HD-9 main frame which actually makes dozer part of tractor. The tractor main frame and dozer are raised and lowered as a single unit.

LIGHTER WEIGHT — BETTER STABILITY. Almost 1,150 lb. lighter than standard dozer. Costs less to buy. And with blade mounted 15 inches closer to tractor, center of gravity is changed only slightly. Less wear on front truck wheels and idlers of tractor.

BIG DIRT MOVER. You get extra yardage because the HD-9's combination of features makes it a real bulldozer tractor — outstanding lugability with powerful GM 2-cycle diesel engine — superior traction with longer track, wider tread.

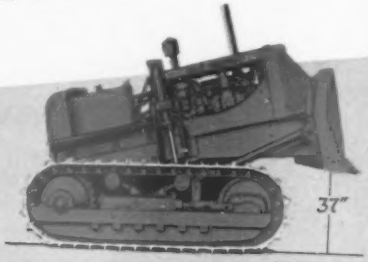
A REAL "MUDDER". Because new type blade mounting provides extra clearance, greatly increased track oscillation and better balance, this team is a phenomenal performer in mud and tough going.

SIMPLIFIED SERVICING. 1,000-hour lubrication of truck wheels, idlers, and support rollers. Unit construction — major tractor assemblies are removable without disturbing companion parts. Dozer mounting does not interfere with engine accessibility. Hinged grill swings out for easy access to dozer hydraulic pump, or to clean radiator core.

EASY TO OPERATE. Just by pulling a single lever, operator can shift from any one of the six forward speeds to any one of the three reverse speeds. This, plus narrow, frame-mounted blade makes the HD-9 particularly fast and maneuverable. With no spring deflection, blade responds immediately and positively to control levers.

BITES DOWN HARD

Full 13-in. drop below ground. Positive down pressure plus steep blade angle means fast penetration.



HIGH LIFT

Full 37 in. above ground. Excellent for pushing over trees and stumps and clearing brush.

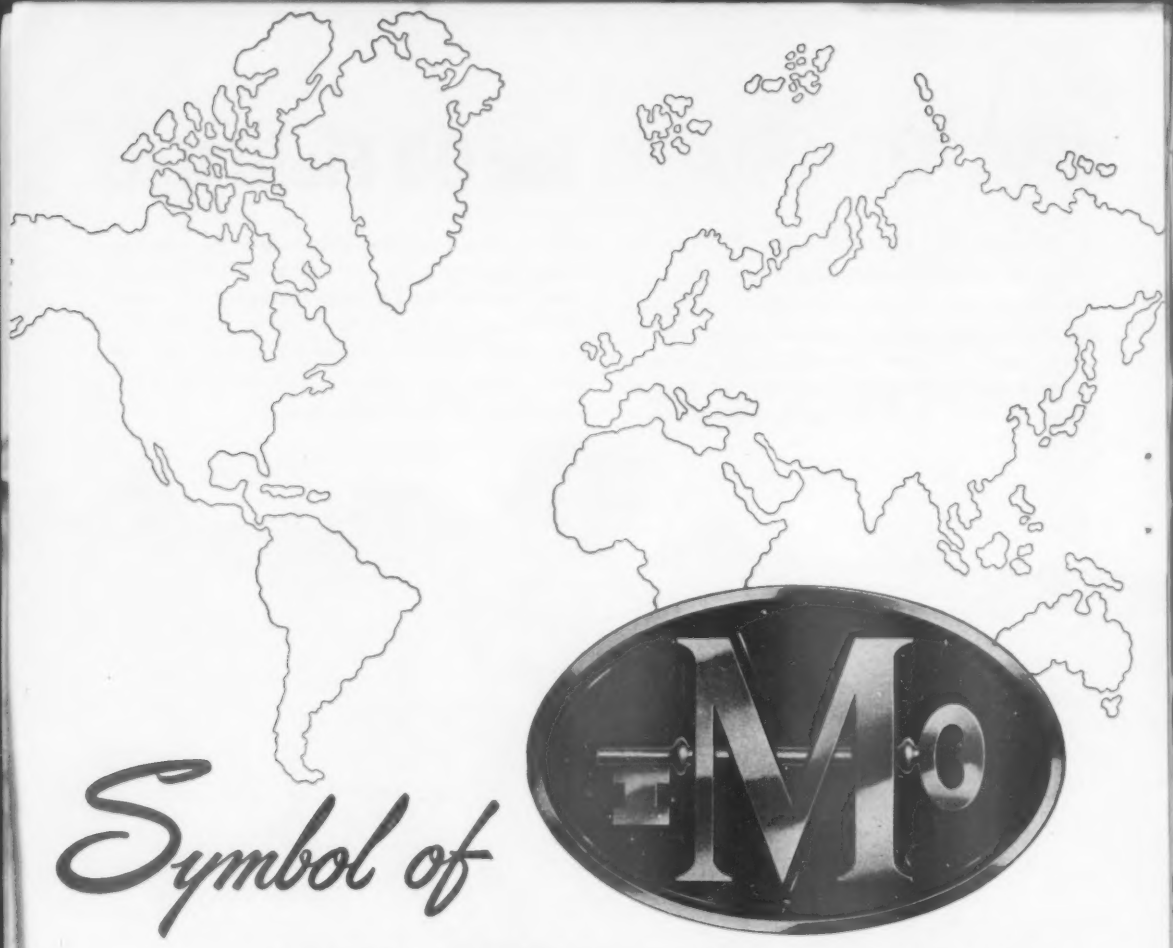
ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Tractor-Dozer for Oil Field Use

The new Allis-Chalmers HD-9 Tractor with Baker 9X no push-beam bulldozer provides these advantages that oil field users have been asking for — **PERFORMANCE — better maneuverability, increased traction in mud and tough going . . . steeper blade penetration permits cutting short, steep pit ramps for faster slush pit digging. TRANSPORT — lighter weight, highway-width blade for 24-hour-a-day transport without special permit. SERVICE — greater accessibility for easier lubrication and maintenance** . . . and at a new, lower original cost. Your Allis-Chalmers dealer will gladly tell you more about how this new combination meets specialized oil field requirements.

Down goes a slush pit — fast. Note how steep blade angle reduces length of ramp. Note how higher, narrower blade handles a bigger vertical load — speeds digging of deep, narrow pit.



Symbol of

ENGINEERING INTEGRITY

● Wherever oil is refined—here in America and in the far places of the world—oil men recognize the McKee name as a symbol of engineering integrity.

Refiners know McKee as a source of sound, practical engineering that comes only from long experience and thorough, up-to-date knowledge. They know the conservative business methods which have always characterized this company's activities. They know McKee as an organization with the scope and resources to undertake any refinery project, large or small, and carry it through to completion with efficiency and integrity.

That's why so many refiners use McKee design, engineering and construction services again and again.

DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

McKee Engineering

Arthur G. McKee & Company • Established 1905

Headquarters: McKee Building, 2300 Chester Avenue, Cleveland 1, Ohio.
New York Office: 30 Rockefeller Plaza, New York 20, N.Y. • *Washington Office:* 1507 M Street, N. W. Washington, D. C. • *England:* The Iron and Steel Division of Arthur G. McKee & Company is represented by Head, Wrightson & Company, Ltd.
District Engineering Offices: Union, New Jersey and Tulsa, Oklahoma.

LADISH *welding fittings and flanges stocked by* VINSON

Vinson warehouses carry a complete and diversified stock of Ladish Controlled Quality Fittings. Whatever your requirements, for size or quantity, check Vinson first.

Welding Fittings, ½" through 30"
Flanges, ½" through 36"
Forged Steel Screwed Fittings, ⅛" through 4"

Depend on Vinson stocks for fast delivery in the oil country.

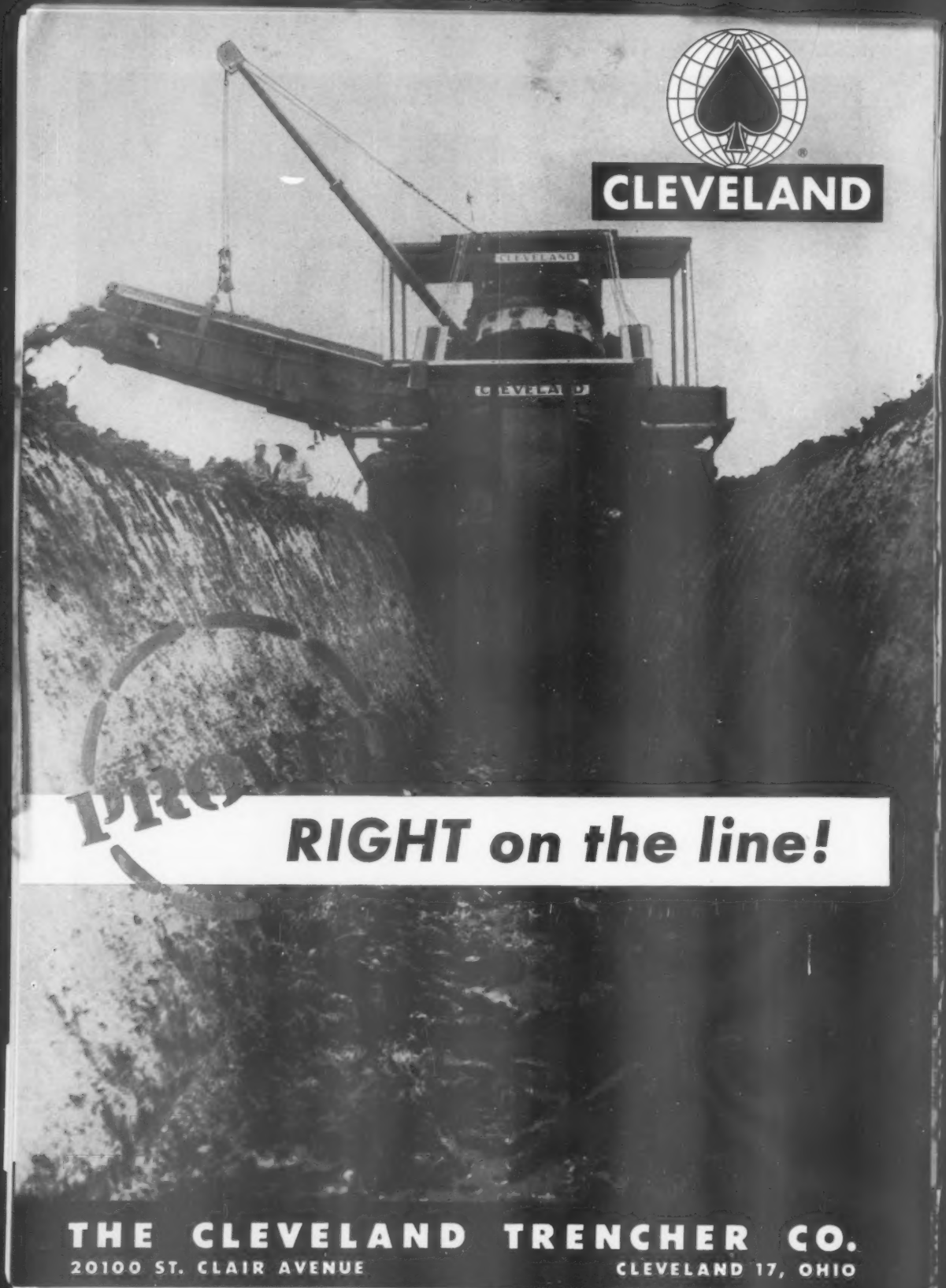
OTHER VINSON LINES

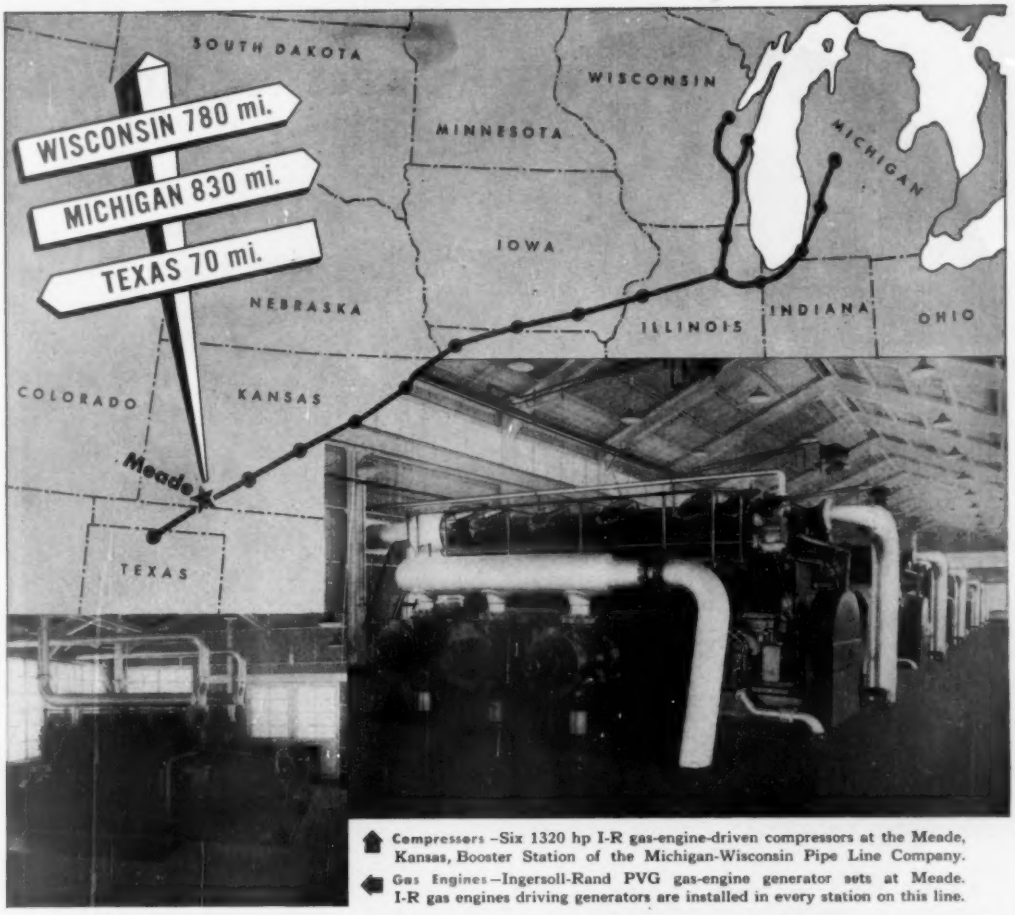
Crane Valves • Nordstrom Valves • Chase Brass Condenser Tubes • Fisher Controls • National Pipe and Steel Tubes

ODESSA WAREHOUSE

Vinson Supply COMPANY

TULSA – 5-6681, L.D. 717
DALLAS – Dixon 3983
ODESSA – 6-4351
SNYDER – 1148


CLEVELAND
CLEVELAND
RIGHT on the line!
THE CLEVELAND TRENCHER CO.
20100 ST. CLAIR AVENUE
CLEVELAND 17, OHIO



Compressors—Six 1320 hp I-R gas-engine-driven compressors at the Meade, Kansas, Booster Station of the Michigan-Wisconsin Pipe Line Company.

Gas Engines—Ingersoll-Rand PVG gas-engine generator sets at Meade. I-R gas engines driving generators are installed in every station on this line.

BOOSTING GAS AT MEADE, KANSAS

for the Michigan-Wisconsin Pipe Line Co.

Annually, 110,000,000,000 cubic feet of natural gas pass through the 1500-mile Michigan-Wisconsin pipeline. In its long journey from Texas, the gas goes through sixteen Booster Stations before reaching millions of ultimate users in the Lake Michigan region.

Typical of these Booster Stations is the No. 1 Station at Meade, Kansas, shown above. Here the Michigan-Wisconsin Pipe Line Company has installed six 1320 hp Ingersoll-Rand KVG gas-engine-driven compressors, and two 370 hp PVG gas engines. In five other stations you will find similar Ingersoll-Rand engine and compressor installations.

The Ingersoll-Rand KVG gas-engine-driven compressor is a 4-cycle V-angle unit built in 660-, 880-, 1100- and 1360-hp. Its conservative rating and 4-cycle flexibility, its economy and reliability, make it a natural for installations wherever gas is available as a fuel.

Ingersoll-Rand branch offices all over the world are ready to serve you. Write or call for complete information.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 724-6

4-CYCLE

ROCK DRILLS • AIR TOOLS • CONDENSERS • DIESELS • GAS ENGINES • PUMPS

Petroleum refining and chemical manufacturing are industries of almost incredible superlatives. They have spent for new facilities since 1945 a sum roughly equal to total gross plant investment for all prior years. In these accomplishments, The Lummus Company—as design engineers and constructors—was privileged to play a major role.

But the years ahead are apt to make the past look puny by comparison. This year, for example, oil companies will top 1951 capital spending by over a third—chemical companies by nearly a fifth. Preliminary plans through 1955 show little or no relaxation from this rate.

Big job? Lummus is ready—a fact you may wish to bear in mind as mounting demands challenge the already-extended organizations of petroleum and chemical companies.

Rely on the quality and versatility of the Lummus staff—on the proven ability of Lummus to handle, under one contract, the functions of engineering, drafting, purchasing, expediting, inspecting, erection and initial operation.

And—as a policy statement for the record—rely on us to recognize and accept the special responsibility of handling confidential information in accordance with your own best interests and desires.

May we work together? We're ready!

THE LUMMUS COMPANY

385 MADISON AVENUE, NEW YORK 17, N. Y.

HOUSTON • CHICAGO • LONDON • PARIS • CARACAS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

A HIGH QUALITY PRODUCT

The Tretolite Company specializes in chemicals and services to combat emulsification and other production problems. Tretolite chemicals are as good as many years of scientific research and manufacturing experience can make them. Tretolite service, designed to help producers overcome many production nuisances, is unparalleled in know-how, field-coverage and experience.

TRETOLITE COMPANY
SAINT LOUIS 17, MISSOURI
LOS ANGELES 22, CALIFORNIA

DEHYDRATING • DESALTING • CORROSION INHIBITING
SCALE PREVENTING • PARAFFIN REMOVING

TP

HOW TO FIGURE THE COST OF STEAM TRAPS

STEAM TRAPS are something like wives. First, there is the cost of securing one and installing it in its new home. Then, there is the cost of maintaining it. Now, everyone knows that some wives are frugal and help their husbands a great deal, while others are frivolous spendthrifts. It is the same way with steam traps. You have to figure the original installed cost, the maintenance cost and the effect on general operation.

Divide the total expenses by life of the trap and you get down to the real heart of the matter—the *cost per year.* This is where Armstrong steam traps really shine! Let's take a look at the details:

DIRECT TRAP COSTS

1. First Cost. The price of Armstrong traps is low in terms of capacity. An optimum relationship between leverage, bucket weight, bucket travel and orifice size gives big capacity in a small package. Armstrong steam trap capacity ratings are based on *actual* tests with condensate at steam temperature and with actual hookups. They tell you what the trap will deliver *on the job.* This is not generally the case with other trap ratings.

2. Installation Cost. In four of the most widely used sizes, Armstrong traps are available in either side inlet—side outlet or bottom inlet—top outlet body styles, making possible the simplest, lowest cost installation.

3. Maintenance Cost. 40% less maintenance with Armstrong traps is the average of all the maintenance reduction reports secured from users over a period of years. This is due to high quality of parts, generous safety factors and inverted bucket know-how.

4. Repair Parts Cost. Armstrong heat treated chrome steel valve parts, precision ground and lapped, last a long time. When they do require renewal, a complete new valve mechanism right off the factory production line transforms an old trap into a new one at low cost.

INDIRECT COSTS

1. Cost of Steam Waste. This cost occurs through leaky trap valves, through traps that stick open or lose prime, through extra hours of operating heat transfer equipment due to poor drainage. This is a cost you can eliminate with Armstrongs.

2. Cost of Efficiency Losses. Poor trapping cuts heat transfer efficiency. Figure how much 10% loss affects the return on a $5000 production unit, or a $1,000,000 plant. Armstrong traps discharge condensate and air as fast as it accumulates, keep steam equipment at peak productive efficiency.

3. Cost of Downtime. Armstrong traps stay on the job long and faithfully, eliminating the production losses caused by excessive downtime for maintenance.

A steam trap casts a mighty big shadow that is multiplied by the number of traps in a plant until it has a major effect on operating costs. When you figure the costs from all angles you will find it pays to specify "traps shall be Armstrong."

FREE: STEAM TRAP BOOK

—44 pages of prices, design, selection, installation and maintenance data on Armstrong steam traps. You are welcome to a copy. Call your local Armstrong Representative, or write.

ARMSTRONG MACHINE WORKS

868 Maple Street • Three Rivers, Michigan

ARMSTRONG
INVERTED BUCKET
STEAM TRAP

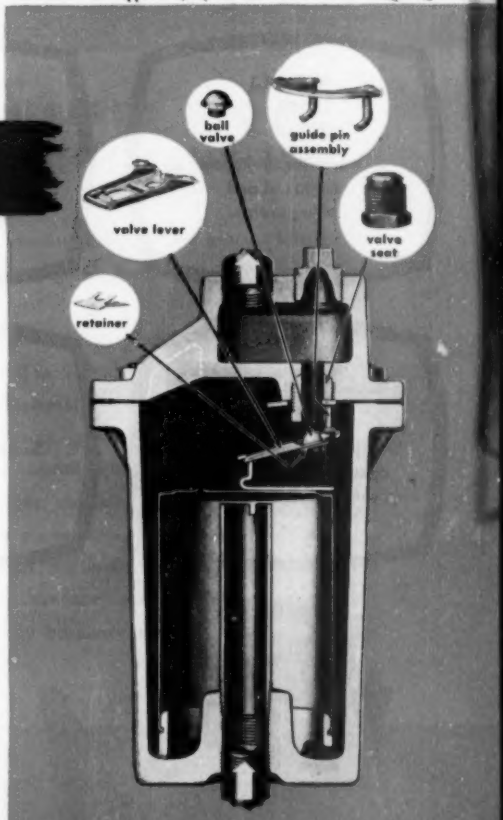
ARMSTRONG

YOU CANNOT BUY A BETTER TRAP THAN AN ARMSTRONG . . .

Here Are Some Questions for Cost Comparison

1. Will the valve stay steam-tight for 2 to 3, or even up to 10 years depending on the service?
2. Will the trap discharge condensate at steam temperature to keep equipment hot and minimize non-productive radiation losses?
3. Will the trap automatically discharge air in sufficient volume to keep equipment at peak temperature and to prevent corrosion?
4. Is there enough safety margin of power in the bucket and lever to open the trap when the orifice enlarges slightly due to wear?
5. Can the trap stick in open position?
6. Is the trap apt to lose prime?
7. Are the published trap capacity ratings accurate and reliable for trap selection purposes?
8. Will the trap cleanse itself of ordinary dirt and scale?
9. Is the trap easy to install, inspect and repair?
10. Is the trap unconditionally guaranteed to give complete satisfaction?

If the trap is an Armstrong, the answer to each of these questions is favorable!



STEAM TRAPS COST LESS!

Why AN AXELSON HYDRAULIC LONG STROKE PUMPING UNIT?

5 PROFIT PRODUCING ADVANTAGES TELL THE STORY

1. INCREASED STROKE LENGTH

Overcomes stroke loss due to rod and tubing stretch.

2. FEWER STROKE CYCLES PER MINUTE

Pumping equipment lasts longer with reduced cycle rates.

3. MORE PRODUCTION WITH GREATLY REDUCED ROD TROUBLE

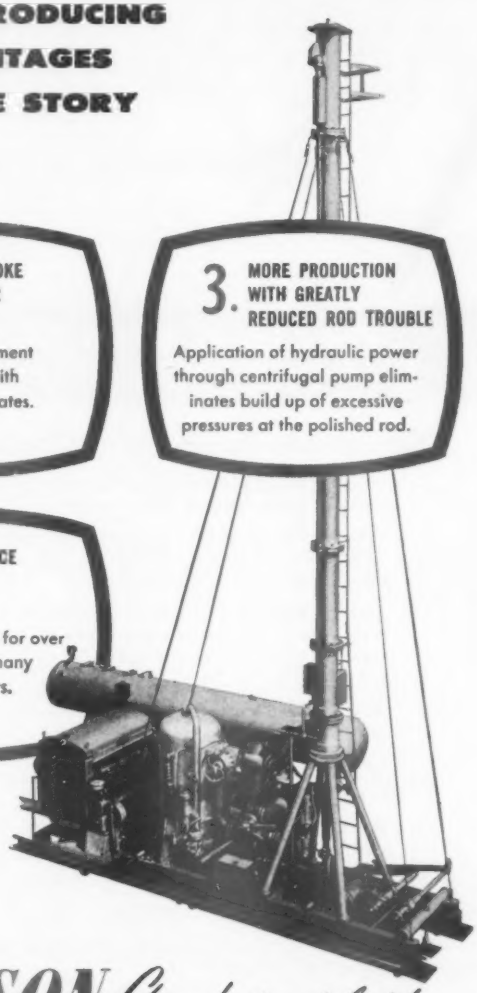
Application of hydraulic power through centrifugal pump eliminates build up of excessive pressures at the polished rod.

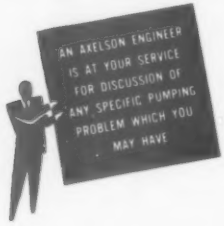
4. LESS DOWN TIME

Unit designed for simplicity of operation and is ruggedly constructed throughout.

5. PERFORMANCE PROVED

Successful field use for over 12 years with many repeat orders.





AXELSON *Chosen first....to last!*

PETROLEUM PUMPING EQUIPMENT

60TH YEAR

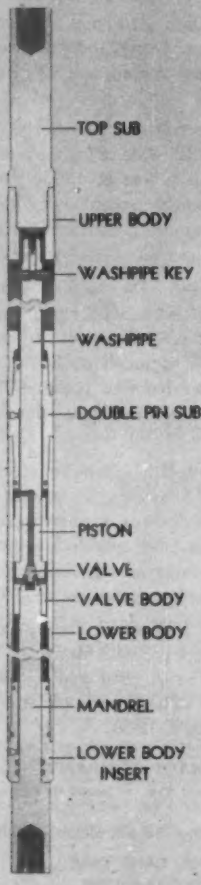
THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON MANUFACTURING CO. • 6160 SOUTH BOYLE AVENUE • P.O. BOX NO. 15335, LOS ANGELES 58, CALIFORNIA

AT YOUR SERVICE

ANOTHER POWERFUL TOOL...

BOWEN CO. OF TEXAS
P. O. BOX 1025, HOUSTON 1, TEXAS



Bowen-Itco Hydraulic Rod Jar

The BOWEN-ITCO Hydraulic Rod Jar for fishing, swabbing, bailing or coring

ANY DESIRED BLOW WHEN YOU WANT IT!

This tool is a smaller version of the famous Bowen-Itco Hydraulic Rotary Jar incorporating the same unique principles.

It can be run on Wire Line or Sucker Rod. It can be rotated or allowed to swivel. It's versatile—easy to operate—easy to assemble.

Rugged in design, precision manufactured, this Rod Jar employs patented principles of hydraulics and mechanics that make possible controlled intensity of each blow. Sizes are available to run inside of 2" and 2½" tubing or larger. We invite your inquiries.

Detailed information and literature available through any of our branches and your fishing tool company.

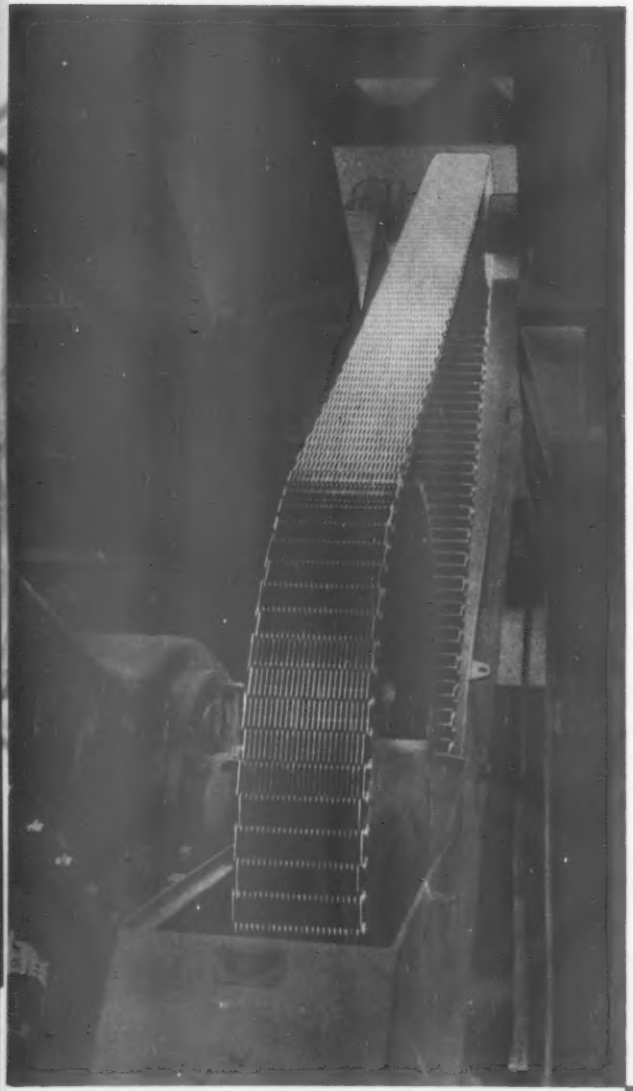
BOWEN CO. OF TEXAS, INC. HOUSTON 1, TEXAS

P. O. Box 1025 Factory and Office: 2429 Crockett St. Phone ATwood 4568

BRANCH WAREHOUSES

ODESSA, TEXAS, 213 North Dixie Blvd., Phone 2-3402
OKLAHOMA CITY, OKLA., 2810 So. High St., Phone Melrose 85087
CORPUS CHRISTI, TEXAS, 4545 Suldein Blvd., Phone 3-5141
NEW IBERIA, LOUISIANA, Corrine and Jane St., 1672-W
HOUMA, LOUISIANA, Magnolia at Barrow St., Phone 6709
CASPER, WYOMING, 620 W. Yellowstone, Phone 3108
FARMINGTON, NEW MEXICO, P. O. BOX 1073, Phone 787-W

New drilling barge's slush pumps driven by Morse HY-VO Drives!



This slender, extra-capacity Morse Hy-Vo Drive aboard the John W. Mecom Company's 180' x 63' drilling-rig barge is one of two Hy-Vo Drives transmitting power from the four 400-h.p. G. M. Diesel engines in the top-deck Emsco J-1600 drawworks.

The new drilling barge of John W. Mecom Company, Houston, Texas, incorporates important new design and engineering advances.

Among them are two slim Morse Hy-Vo Drives (2″ pitch x 8″ wide, 2″ pitch x 6″ wide) that transmit power at 4350-f.p.m. velocity from the four compounded 400-h.p. G. M. Diesel engines in the Emsco drawworks to the two power slush pumps below decks.

Morse Hy-Vo transmits up to 5000 h.p., can operate at speeds of 3600 r.p.m. and linear velocities of 6500 f.p.m. It reduces operating costs by as much as 50%. It gives ⅓ longer service life, operates ⅓ cooler than conventional drives, with ⅓ less noise.

Hy-Vo does away with expensive, space-eating outboard bearings. It provides smooth, positive power transmission throughout its extra-long, trouble-free service life. Hy-Vo permits savings in weight and space never before possible.

Examine your high-speed, heavy-duty power transmission needs with Morse Hy-Vo Drive in mind. Let us give you specific information on Hy-Vo for those applications. Or send for Catalog C-72-51.

MORSE CHAIN COMPANY
Dept. 356 • 7601 Central Ave. • Detroit 10, Michigan

Branch offices serving the petroleum industry:

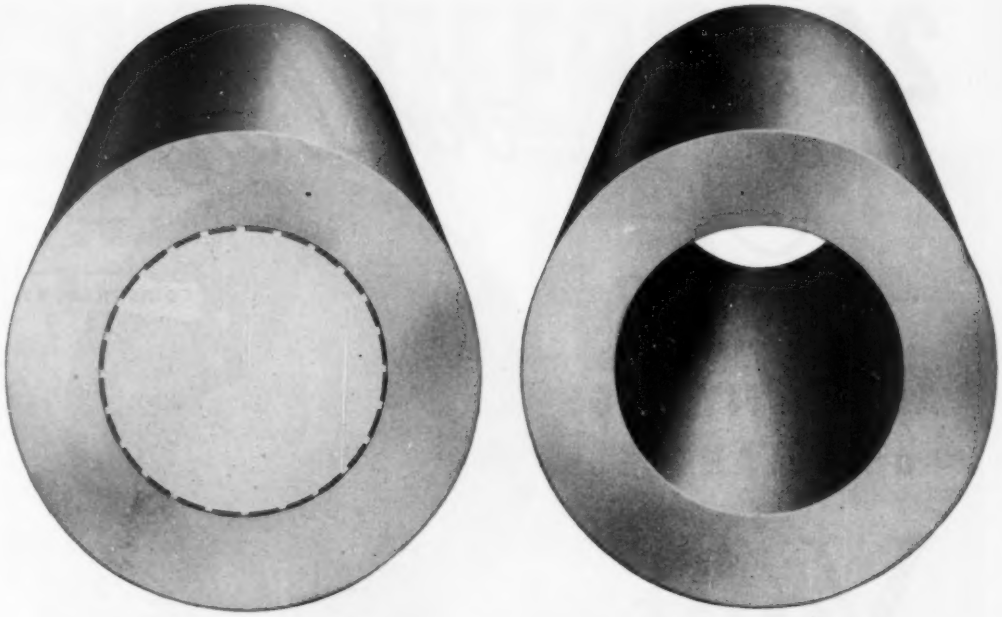
PASADENA, CALIFORNIA
1571 Harding Avenue

HOUSTON, TEXAS
1312 LaBranch Avenue • P.O. Box 896

PITTSBURGH, PENNSYLVANIA
503 Martin Building

M=PT; Morse *means* Power Transmission

MORSE
MECHANICAL
POWER TRANSMISSION
PRODUCTS



HOW TO SAVE THIS HOLE STEP when you make hollow parts

THE center hole is already there when you use Timken® seamless tubing instead of bar stock for hollow cylindrical parts. Drilling is eliminated; finish boring is often your first production step. Because there's less steel to machine away, you get more parts per ton of steel. And to assure you further savings in material, the Timken Company offers a tube engineering service which recommends the most economical tube size for your job—*guaranteed to clean up.*

You make your machine tools more productive by using Timken seamless tubing. Since you don't have to drill the center hole, screw machine stations can be released for other operations. You get added machining capacity without adding machines.

You get a better quality product, too. The piercing operation by which Timken tubing is made is basically a forging operation. This gives the tubing a uniform spiral grain flow and a refined grain structure that brings out the best in the quality of the metal. And this quality is uniform from tube to tube and heat to heat, due to the Timken Company's rigid quality control. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

24 ACRES *Cover the World*

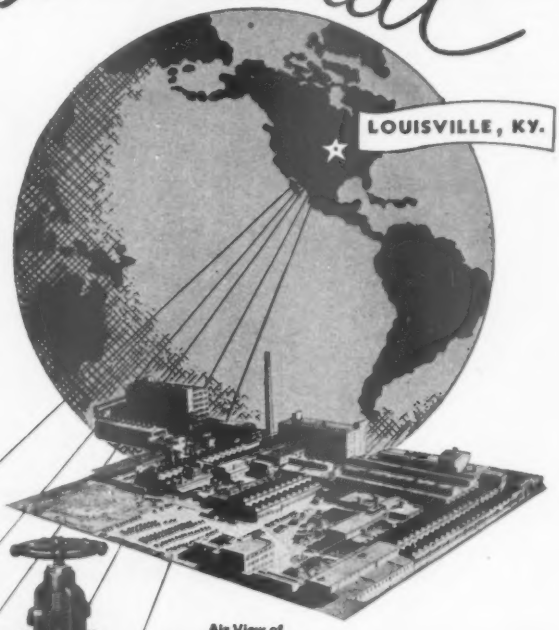
. . . with TOP QUALITY

DROP FORGED STEEL

VALVES, FITTINGS and FLANGES

by

Vogt



Air View of
Henry Vogt Machine Co.

This 24 acre Vogt plant supplies the most comprehensive line of top quality *drop forged* steel piping materials anywhere available to industry. That's why they're the choice of leading refineries, power plants, chemical plants, etc., the world around!

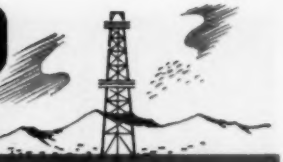
OUR COMPLETE LINE INCLUDES

Flanged, Screwed and Socket Weld End Globe, Gate and Check Valves • Ells, Tees and Crosses • Couplings • Bushings • Plugs • Unions • Flanges and Flange Unions • Welding Heads

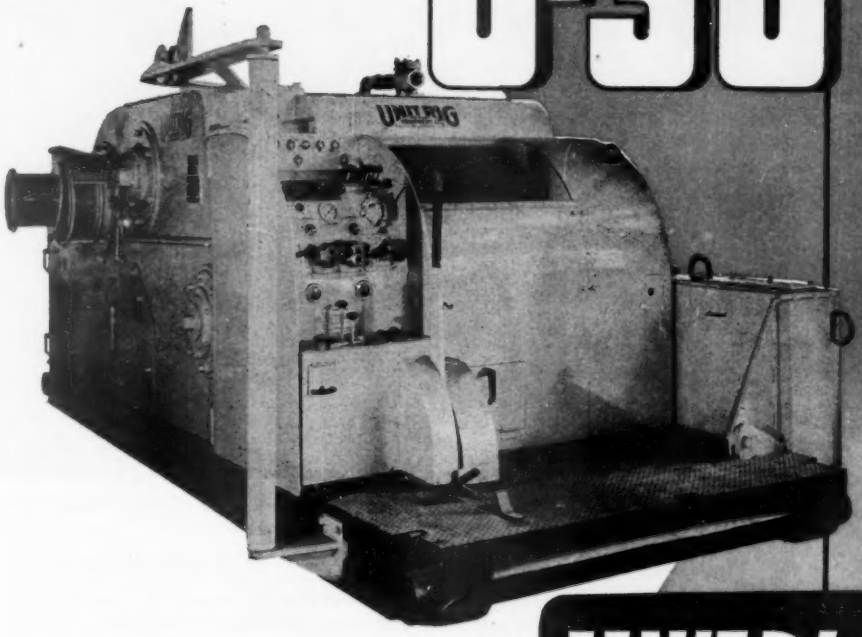
HENRY VOGT MACHINE CO. LOUISVILLE 10, KY.

Branch Offices: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

GOING DEEP?



USE UNIT RIG'S U-30



Here's the BIG Rig for BIG Jobs. If you are drilling from 10,000 feet to 18,000 feet, the U-30 is the drawworks for you. Low first cost plus economical operation in a wide range of depths make the U-30 break performance records for drilling to almost any depth. Choose the U-30 for deep well drilling.

UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

DESIGNED FOR THE JOB...

UR-515

UNIT RIG DRAWWORKS ARE SOLD EXCLUSIVELY THROUGH THESE AUTHORIZED DISTRIBUTORS IN THE U.S.A. AND CANADA.

BOVAIRD SUPPLY COMPANY
HOUSTON OIL FIELD MATERIAL COMPANY
HOWARD SUPPLY COMPANY
IVERSON SUPPLY COMPANY
JONES & LAUGHLIN SUPPLY COMPANY
LUCEY PRODUCTS CORPORATION
MID-CONTINENT SUPPLY COMPANY
NORVELL-WILDER SUPPLY COMPANY
OIL WELL SUPPLY COMPANY

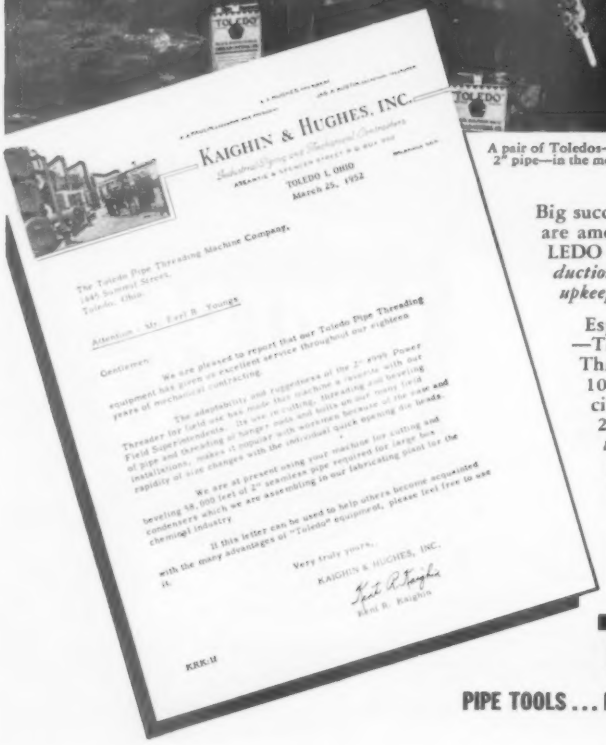
EXPORT SALES — MID-CONTINENT SUPPLY COMPANY, 42 Broadway, New York City. Cable — MIDUNITRIG

"TOLEDO No. 999 2" POWER THREADER

a favorite with Field Superintendents!"

. . . says 18-YEAR USER

A pair of Toledos—No. 1-2-4 (at left) for 1" to 4" pipe; and No. 999 for up to 2" pipe—in the modern pipe shop of Kaighin & Hughes, Inc., Toledo, Ohio.



KAIGHIN & HUGHES, INC.

TOLEDO 1, OHIO

March 25, 1952

The Toledo Pipe Threading Machine Company,
1445 Summit Street,
Toledo, Ohio.

Attention: Mr. Earl B. Yeager

Gentlemen:

We are pleased to report that our Toledo Pipe Threading equipment has given us excellent service throughout our eighteen years of mechanical contracting.

The adaptability and ruggedness of the 2" steel Power Threader for field use has made this machine a favorite with our Field Superintendents. Its use in cutting, threading and beveling of pipe and threading of bonger nuts and bolts on our many field installations, makes it popular with our workmen because of the ease and rapidity of size changes with the individual quick opening die heads.

We are at present using your machine for cutting and beveling 18,000 feet of 2" seamless pipe required for large box condensers which we are assembling in our fabricating plant for the chemical industry.

If this letter can be used to help others become acquainted with the many advantages of "Toledo" equipment, please feel free to use it.

Very truly yours,

KAIGHIN & HUGHES, INC.

Earl B. Kaighin

KRK:H

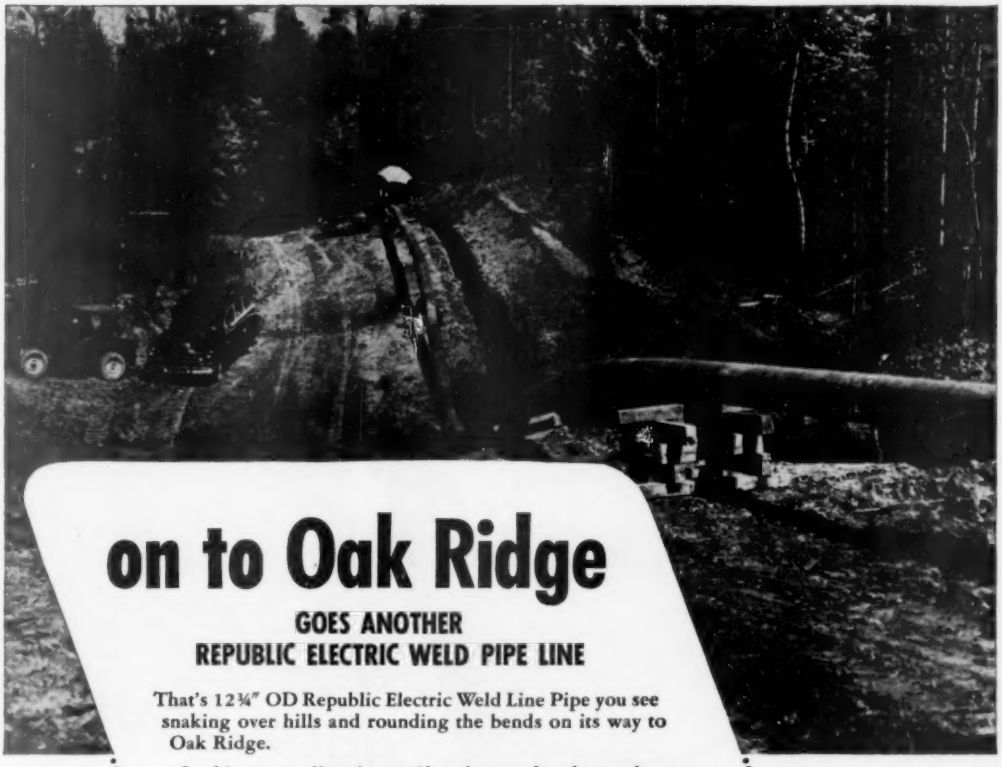
Big successful outfits like Kaighin & Hughes, Inc., are among the many users who have found TOLEDO Power Pipe Machines "tops" for *high production . . . easy operation . . . long life . . .* and *low upkeep.*

Especially popular in pipe shops or in the field —Toledo No. 999 2" Portable Power Threader! Threads 2" pipe in 22 seconds . . . cuts off in 10 seconds. *Built to last* with the rugged precision of a fine lathe. Many No. 999's in use 20 years *and more!* This means *lower cost to own*—another advantage of Toledo dependability! Write for new catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

50 Years of Leadership

TOLEDO

PIPE TOOLS . . . POWER PIPE MACHINES . . . POWER DRIVES



on to Oak Ridge

GOES ANOTHER REPUBLIC ELECTRIC WELD PIPE LINE

That's 12¾" OD Republic Electric Weld Line Pipe you see snaking over hills and rounding the bends on its way to Oak Ridge.

In this top-quality pipe, uniformly round ends match perfectly. Its uniform diameter speeds field welding. Made of low carbon steel, it welds readily. Those uniformly straight lengths line up evenly. Long lengths reduce the number of joints. High ductility steel simplifies field bending. Uniform high yield strength permits building of higher pressure lines. Uniform wall thickness means dependability in every inch. And, its freedom from scale protects against clogged valves.

More than *63,000 miles* of Republic Electric Weld Line Pipe have been placed in service during the past 23 years . . . in transmission, distribution, collecting and product lines. There's convincing proof of its complete dependability.

Write for literature.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic
REPUBLIC STEEL
ELECTRIC WELD LINE PIPE

Other Republic Products include Line Pipe—Carbon, Alloy and Stainless Steels—Upson Studs, Bolts and Nuts—Electrunite Heat Exchanger Tubes

Getting the Job Done

in the Permian Basin

THE

WILSON

TYPE "MB"

Metal Block

PACKER

with

HOLD-DOWN

REMEMBER

The Type "MB" Packer *cannot* cold-flow, regardless of how great the Hydrostatic Head.

•

SOLD THRU SUPPLY STORES

For *Hydrafrac Operations, Acidizing, Dual Completions and Gas or Water Injections — the Wilson Type "MB," Metal Block Packer, with Hold-Down is proving to be in a class by itself in giving satisfactory service under most difficult conditions.

The Wilson Type "MB" Packer, with Hold-Down is Full Opening. It will *hold,* regardless of how low the well is swabbed, as it will hold a high differential from underneath, assuring an efficient Acidizing or *Hydrafrac job.

* Copyrighted name.

•

This is an outstanding development in Packer design and construction. It will save you time and money to run the Wilson Type "MB," Metal Block, Packer, with Hold-Down.

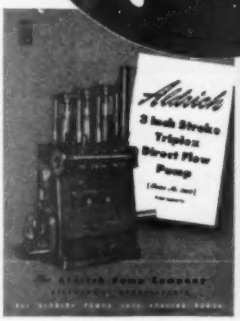
•

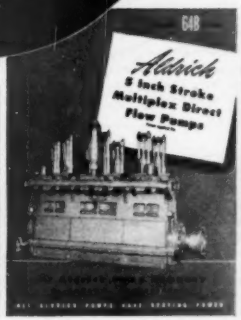
WILSON FOUNDRY & MACHINE CO.

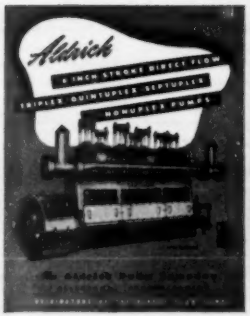
1417 ELYSIAN STREET HOUSTON, TEXAS

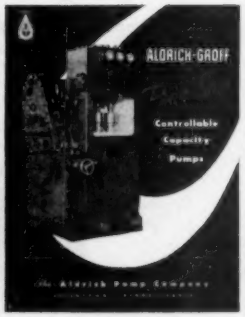
HERE'S HELP

For Men Who Specify, Buy or Use Reciprocating Pumps









☐ 10 to 50 hp ☐ 50 to 275 hp ☐ 300 to 900 hp ☐ 5 to 125 hp

Tear out this page NOW and send for these Aldrich Data Sheets

These 2-color data sheets give full details of design and construction, including dimension and sectional drawings, performance data and pump specifications.

Aldrich Pump Applications

. . . include water flooding, salt water disposal, lean oil service; crude, gathering and product lines, bottom hole pump service, pumping liquid hydrocarbons.

CHECK THE ONES YOU WANT—ONE OR ALL!
Be sure to fill in your name and address. Then mail this page to: The Aldrich Pump Company, Allentown, Pa.

NAME_____

COMPANY_____

ADDRESS_____

THE ALDRICH PUMP COMPANY
9 GORDON STREET • ALLENTOWN, PENNSYLVANIA

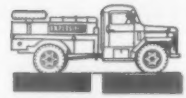
...Originators of the Direct Flow Pump

Representatives: P. H. Arden, P. O. Box 185, Glenview, Ill. • Bushnell Controls & Equipment Co., 3929 W. Jefferson Blvd., Los Angeles 16, Calif. • L. T. Gibbs, 509 Petroleum Bldg., Tulsa 3, Okla. • R. B. Moore Supply Co., Inc., Bolivar, N. Y. • Power Specialty Co., 2000 Kipling St., Houston 6, Texas • Reeves & Skinner Machinery Co., 2211 Olive St., St. Louis 3, Mo. Stearns-Roger Manufacturing Co., 1720 California St., Denver 2, Colo. • Export Sales: Petroleum Machinery Corp., 30 Rockefeller Plaza, New York 20, N. Y. • Birmingham • Boston Buffalo • Cincinnati • Cleveland • Detroit • Duluth • Jacksonville • Omaha • Philadelphia • Pittsburgh • Portland, Ore. • Richmond, Va. • San Francisco • Seattle • Spokane, Wash. • Syracuse

Advantages like these help you

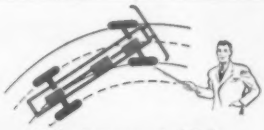
Speed Oil Exploration!

Get more productive time with this Light-Duty FWD that moves equipment and supplies to any location



Proper Weight Distribution

Only a true 4 x 4 gives you up to 50% of the weight on the front wheels. This gives you the extra traction needed to work in any footing, any weather.



Fully Compensated Drive

Three free-acting differentials compensate for the differences in travel of all four wheels. Reduces drive line strains, eliminates needless tire scuffing.

Real Truck Engine—Real Truck Parts

The FWD LD is designed and built for rugged use . . . pays off in more productive time, fewer breakdowns in field.

High-Climb Oil Sump

Keeps oil pump constantly submerged. An FWD exclusive that lets you drill holes on the steepest grades.

A Leader for Geophysical Service

The LD is the answer for work which conversions and conventional trucks have long sought to do. As a water carrier it makes more trips daily, as a drill truck it reaches more locations, drills more holes daily. Can also be equipped as a shooting or recording truck, or to haul equipment and supplies.

Created (Not Converted) as a True 4-Wheel Drive, the LD gives you all the advantages of proper distribution of weight and power. The LD will travel over terrain that stops other trucks . . . it drastically cuts trip-time . . . helps maintain faster schedules . . . and earns more for your equipment dollar. Your FWD dealer will be happy to give you all the facts on the versatile LD . . . and the other great FWD 4 x 4 or 6 x 6 "mobilized tools" for the oil industry. Contact him or write FWD direct. The Four Wheel Drive Auto Co., Clintonville, Wisconsin. *Canadian factory,* Kitchener, Ontario.

Built by the makers of America's Foremost Heavy-Duty Trucks

THE OLD DUTCHMEN SAID :

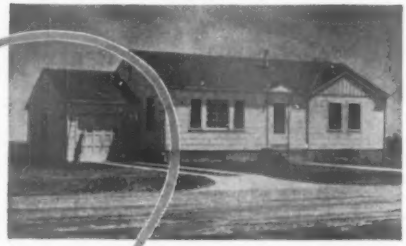
„Spreken is zilver en zwijgen is goud!"

(SPEAKING IS SILVER AND SILENCE IS GOLD)

SCHLUMBERGER-SERVICE IS HELD IN STRICT CONFIDENCE!

WHY OPERATORS PREFER SCHLUMBERGER!

WHICH HOUSE IS NOT PREFABRICATED?



This is a fooler. ALL the houses here are prefabricated. In fact they are all standard STURDYBILT designs now in use in oil fields in many parts of the country.

Users of STURDYBILT Prefabricated, Demountable Houses know they get *all* the features of conventional houses, plus many other advantages.

STURDYBILT Houses are attractive, comfortable and weather tight. At the same time, they can be easily transported and erected anywhere a truck can go. They can also be "knocked down" and moved to a new location with practically no loss of material.

Specify STURDYBILT Prefabricated Houses for all your field housing needs.

MANUFACTURERS OF SPECIAL WOODWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK

STURDYBILT

PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Best Buy

...Here's Why!

Aeroquip Detachable, Reusable Fittings reduce hose line inventory. For on-the-spot replacements cut bulk hose to required length and attach fittings.

Unique Fitting design provides quick, easy assembly and assures positive grip on hose. No adjusting is required after assembly.

Hose is constructed of seamless synthetic rubber compound reinforced with two cotton braids and a high tensile steel wire braid.

Wide range of male and female end fittings in all sizes meet practically every requirement. Fittings are designed to SAE and JIC specifications.

Tough, durable Aeroquip Hose Lines are fire resistant. They perform satisfactorily at extreme temperatures—from —40° to +275° F.

Aeroquip Hose Lines are widely used with hydraulic fluids, lubricants, water, gasoline, Diesel fuel, air, and many other fluids.

Always first

AEROQUIP FLEXIBLE HOSE LINES OUTSELL ALL OTHERS FOR INDUSTRIAL AND AIRCRAFT APPLICATIONS

Aeroquip

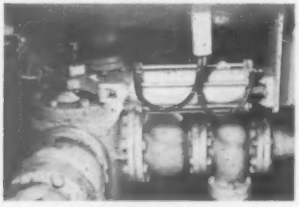
REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

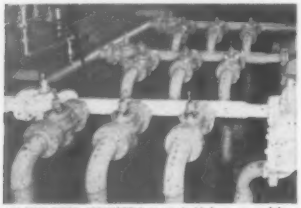
SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA. MINNEAPOLIS, MINN. • PORTLAND, ORE. • WICHITA, KAN. • TORONTO, CANADA

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

IN SEWAGE PLANTS, these electrically-timed, fully-automatic, air-cylinder operated a.c.f. Valves shear obstructions.



IN CHEMICAL PLANTS air-operated a.c.f. Valves offer super-dependability...self protected from abrasive and corrosive action.



IN THE STEEL INDUSTRY a.c.f. Valves provide split-second control of fuel oil and gas to furnaces and coke ovens.

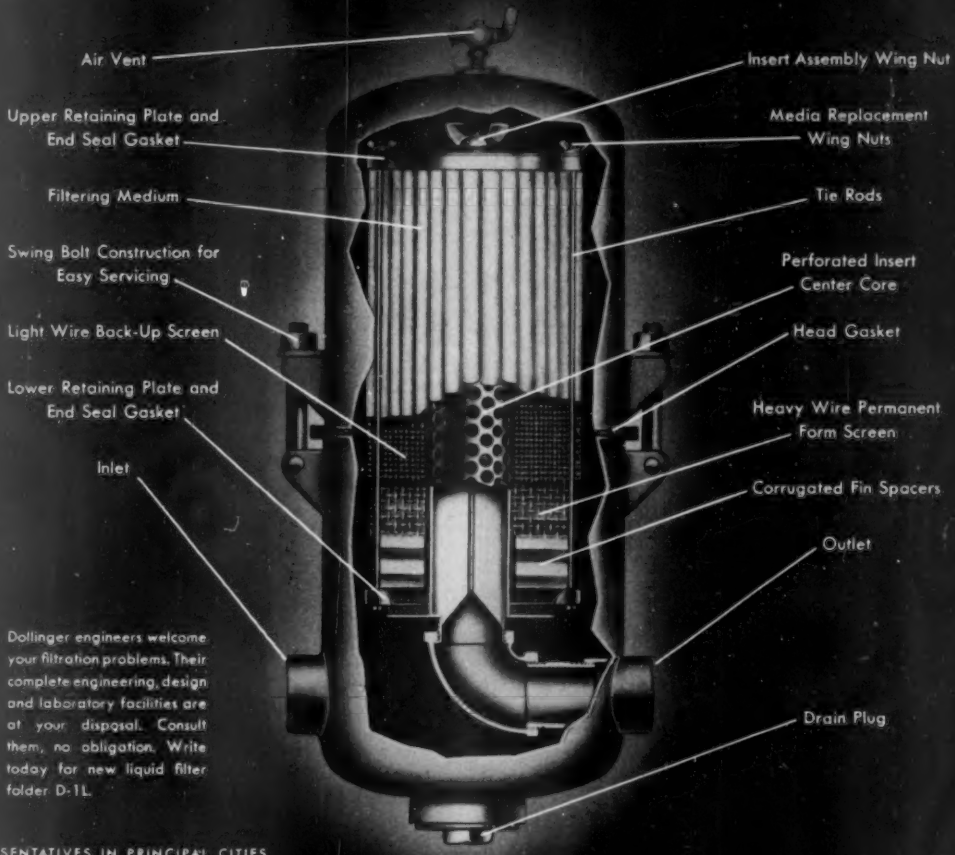
SPLIT SECOND ROBOT CONTROL

a.c.f. CYLINDRICAL Plug Valves are ideal for all types of automatic operation: hydraulic, electrical, or air operated. The quick quarter-turn from full-open to full-closed is always sure as there's no wedge effect to cause jamming in the seat. In addition, all bearing surfaces are lubricated for easy turning. Sound reasons to insist on a.c.f. Plug Valves for all automatic valve operations.

a.c.f. CYLINDRICAL FULL PIPE AREA PLUG VALVES

Write for Catalog 4-OG, American Car and Foundry Co. Valve Division, 1501 E. Ferry Ave., Detroit 11, Michigan

Representatives in 50 Principal Cities



Dollinger engineers welcome your filtration problems. Their complete engineering, design and laboratory facilities are at your disposal. Consult them, no obligation. Write today for new liquid filter folder D-1L.

REPRESENTATIVES IN PRINCIPAL CITIES

STAYNEW LIQUID FILTERS

THE ANSWER
TO YOUR LIQUID
FILTRATION
PROBLEMS

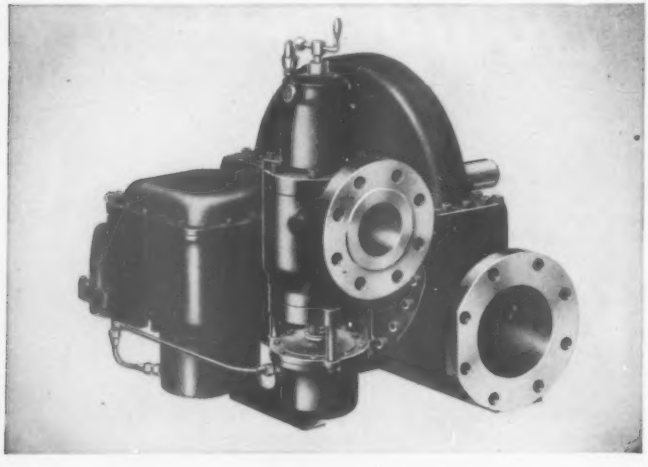
DOLLINGER
PROTECTOMETER
STAYNEW FILTERS

DOLLINGER
CORPORATION

5 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

Mr. A. Bourgeois, process foreman at Sohio Refinery, adjusts pump valve. Type DP-20, 125 hp turbine increased by 75% the oil thru-put of this pump which supplies crude oil for the distillation unit.



Type DP MECHANICAL-DRIVE TURBINE

This Type DP turbine is one of General Electric's line of mechanical-drive turbines designed for driving pumps, compressors, blowers, etc. Their sturdy construction and many safety features make them ideal for many petroleum industry applications.

At Sohio's Toledo Refinery, this 15 hp, Type DP-16 turbine with non-sparking enclosed overspeed governor, safely pumps propane in an explosive atmosphere.

Mr. Eugene Ten Eyck and Mr. E. J. Bissonnette of Sohio Refinery discuss stocking of interchangeable parts for the Type DP turbines installed at the Refinery.

Sohio Refinery picks G-E turbine drives to increase oil thru-put

Engineers at Sohio's Toledo Refinery installed two G-E mechanical-drive turbines to help eliminate a bottleneck in refinery operations. A General Electric Type DP-20 turbine increased oil thru-put on one pump at Sohio by 75%, when it replaced older drive equipment. Total daily thru-put of the one pump now equals the former capacity of two pumps.

INSTALLED IN HAZARDOUS AREA

Sohio also installed a G-E Type DP-16 turbine in an explosive atmosphere to pump almost pure propane. The enclosed, non-sparking overspeed governor and the positive trip-throttle valve (which shut off all steam flow in case of overspeed) reduce hazards in this area. The turbine, which operates twenty-four hours per day, has required no maintenance during its first year of service.

VIBRATION REDUCED

Replacement of previous drive equipment with a G-E turbine now assures longer life to other machinery in the area. For G-E turbines with their center-line support and rigid assembly of buckets are now contributing to smooth operation at the refinery.

INTERCHANGEABLE PARTS

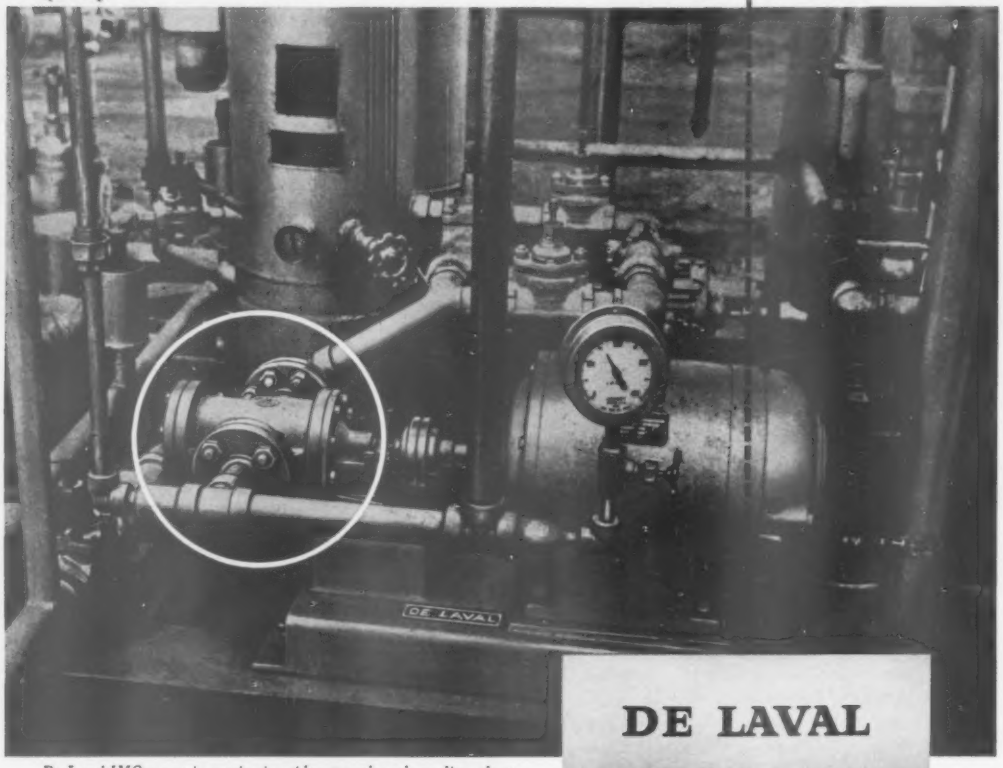
Use of G-E standard turbines can make stocking of spare parts a simple matter—most replacement parts are interchangeable among various frame sizes of G-E Type DP turbines. Stocking costs are cut, yet parts are available when needed.

This same parts standardization adds to the turbine's flexibility—often the turbine can be adapted to a new plant application with only minor adjustments. Horsepower range can be changed by substituting a different nozzle plate and valve parts.

For more information about the many advantages which these standardized turbines offer the petroleum industry, call in your G-E sales-engineer or write for bulletin GEA-4955A, "A New Standard in Mechanical-drive Turbines." Section 252-56, General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

Versatile pumps for refinery service



De Laval-IMO pump in service in midwest packaged gasoline plant.

DE LAVAL

IMO PUMPS

Today, De Laval-IMO rotary pumps are proving their versatility in dozens of refinery applications. These dependable pumps are being used in refineries and bulk plants to handle viscous fluids including fuel oils, heavy crude oils, lubricating oils and asphalt, as well as the lighter hydrocarbons. For example:

An eastern refinery installed an IMO to pump *viscous* oil at 550 psi. Performance was so satisfactory that three more IMO units were ordered within a few weeks.

A midwest refinery is using De Laval-IMO pumps to handle *asphalt* at 470F at 922 psi and *petrolatum* at 420F and 575 psi.

For a new tank field distribution system, another refinery has 58 direct-connected 1150 to 1750 rpm IMO pumps, handling various oils with viscosities up to 3600 SSU, capacities to 200 gpm and pressures to 150 psi.

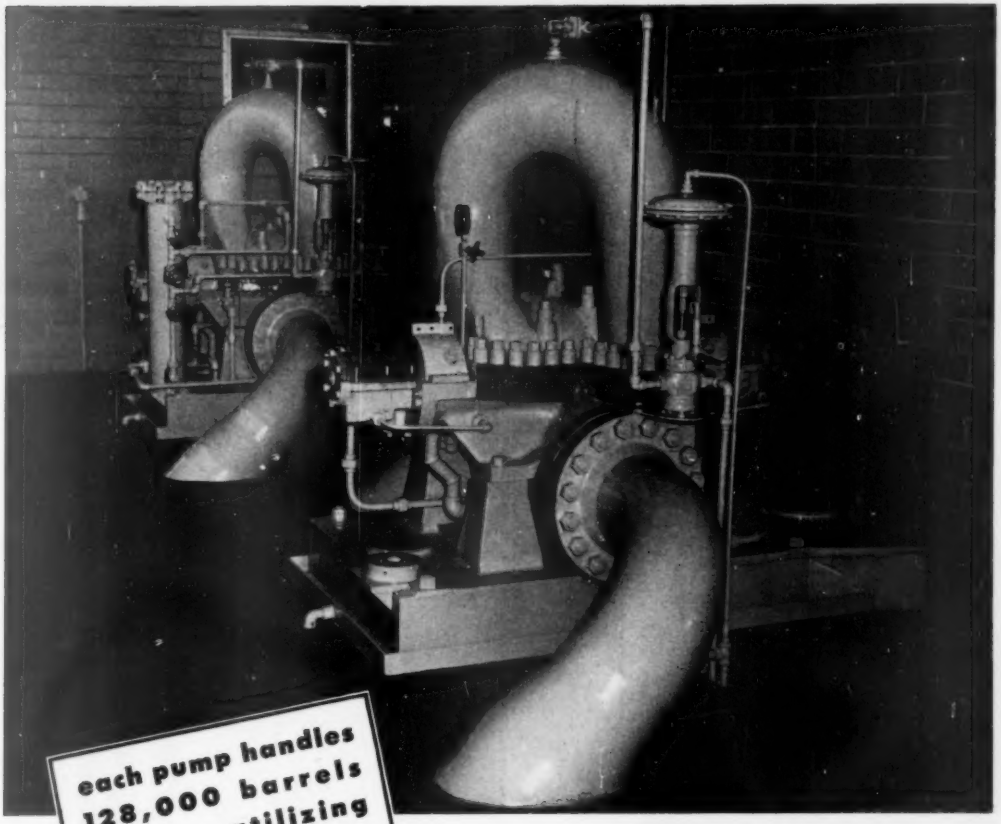
The unique IMO design—*with only three moving parts* — assures long, trouble-free performance. IMO pumps are quiet, pulsation-free, compact and designed for direct-connected high-speed operation. Send for Bulletin LG showing wide range IMO line for capacities to 1,000 gpm at pressures to 500 psi and for capacities to 150 gpm at pressures to 1,500 psi.

DE LAVAL *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY

Trenton 2, New Jersey

DL 151



each pump handles 128,000 barrels daily . . . utilizing LOW COST

Electric Power

The above pipe line installation is one of three stations on a major company line, each pump designed to handle 128,000 barrels of oil a day. This is typical of hundreds of pipe line stations now powered by LOW COST UTILITY ELECTRIC POWER!

Petroleum Electric Power Association

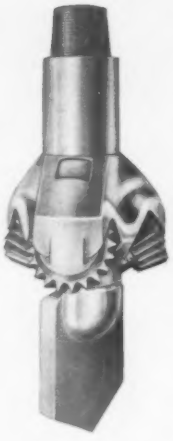
ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

CALL YOUR NEAREST ELECTRIC SERVICE COMPANY FOR MORE FACTS

OR ADDRESS YOUR REQUEST TO P. O. BOX 2771, DALLAS, TEXAS

For high speed drilling

CP THREE CONE ROCK BITS are furnished in five types: for drilling in the softer shales and unconsolidated formations, Type ES-2; for soft to medium formations, Type ES-3; for hard sands, hard shales, Type EM-2; for rocks of high compressive strength, Type EM-3; for exceedingly hard, abrasive formations, Type EH-1 (illustrated).



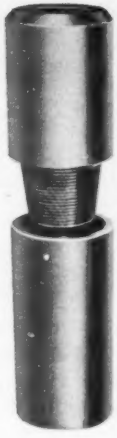
FOR A SMOOTH RUNNING, fast cutting straight hole reaming job — C-1 Reaming Bits. Properly placed pilot blade guides reaming bit, assures concentricity of large hole with pilot hole. Unitized welded-in cutter prevents loose parts from falling off in the hole. Hard-faced cutters on ball and roller bearings give maximum cutter life.

OUTSIDE DIAMETER CONCENTRIC with bored hole. CP Drill Collars are made of carefully selected steel, heat treated to develop maximum hardness in the center section. High impact values assure toughness to withstand shock loads. Bored to mirror-like finish and vertically quenched for controlled hardness through the entire length.

Oil Tool Division Office: One N. W. 16th Street, Oklahoma City, Oklahoma

In Canada: 10103 81st Avenue, So. Edmonton, Alberta, Canada • In Mexico: Mexico, D. F., Rosas Moreno No. 41; Tampico, Tamps., Apartado No. 174.
Special Oil Tool Export Agent: E. F. Gahan, Inc., 500 Fifth Ave., New York 17, N. Y. (West Indies, Central and South America, exclusive of Mexico)

and maximum footage



COUNTERBORE WELDING of CP Tool Joints eliminates stress at last engaged thread. Pipe threading, cut after heat treatment to avoid all danger of warping, is of the highest accuracy. Each make-and-break thread is subjected to a water pressure test of 2,000 pounds per square inch to make certain the threading is absolutely watertight.

CP SIDE DOOR JUNK BASKETS are unexcelled for cleaning hole before running diamond core drill. Side opening provides maximum inlet for larger fragments — without sacrificing strength and safety. Designed to run directly above bit, making special trip to catch junk unnecessary. Furnished with Regular pin up, Regular box down.

TO ELIMINATE TAPERED HOLES — use CP Type B Reamers. CP "bottom" reamer, run close above the bit, insures a true round, full-gage hole. CP "stabilizer" reamer centers drill stem and prevents wall drag. Cutters securely held in reamer body by tapered keys.

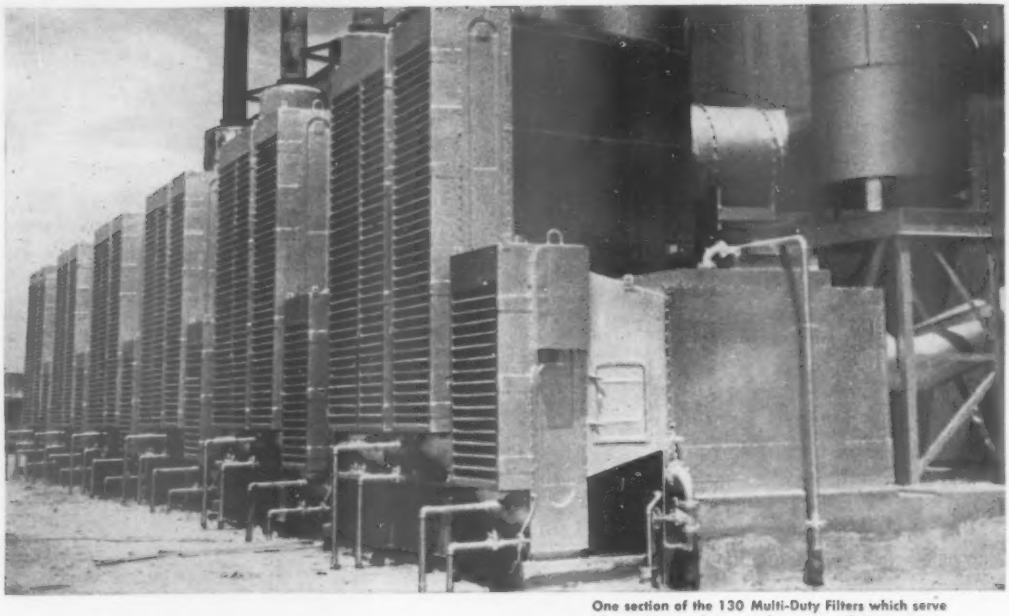
CP Fiftieth ANNIVERSARY

WRITE FOR COPY OF BULLETIN 1001

CHICAGO PNEUMATIC TOOL COMPANY

MANUFACTURED AT FRANKLIN, PA.

GENERAL OFFICES: 6 EAST 44th STREET, NEW YORK 17, N.Y.



One section of the 130 Multi-Duty Filters which serve 83 engines and power house ventilation system.

Filtering 5,500,000 cfm!

130 AAF Multi-Duty Filters Serve Engine Room of New Reynolds San Patricio Plant

Imagine a power plant capable of supplying electricity for the combined residences of Ft. Worth, Dallas, Houston and San Antonio! That's the generating capacity of the 83 engines serving Reynolds Metals new aluminum reduction plant at San Patricio, Texas.

This "powerhouse" is made up of 42 Cooper-Bessemer, 3700 hp., 4-cycle, supercharged engines and 41 General Motors, 2850 hp., 2-cycle radial gas engines. Their air intake requirements plus that of the engine room ventilating system total 5,500,000 cfm.

Protecting this multimillion-dollar investment against the ravages of dust and dirt are 130 AAF Multi-Duty Type CMS Filters. These filters, designed for heavy dust loads, clean both the air and themselves *automatically*. It is this continuous, self-cleaning action that assures uniform air delivery and constant high air-cleaning efficiency. And in this installation the Viscosine filter oil is continuously circulated and cleaned to further simplify maintenance.

This installation solves Reynolds air-cleaning problems. Yours may be different. AAF has both engineering experience and a line of filters which, when combined, result in the solution—not just a sale. We'll welcome the opportunity to work with you in cutting costs with clean air.

Today's Best Buy is Better Air!

AAF

American Air Filter

COMPANY, INC.

444 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P.Q.

MINNEAPOLIS MOLINE
MM
MODERN MACHINERY

5 big advantages for continuous duty and long life

- EXTRA HEAVY CONSTRUCTION
- STANDARDIZED QUALITY CONTROLLED PARTS
- SLUDGE-FREE OPERATION
- UNIFORM OPERATING TEMPERATURE
- PIONEER OIL FIELD APPLICATION EXPERIENCE

Length of engine life is determined by the stamina built into the parts. By comparing the weight and size of parts you can calculate how long they will last and give trouble-free continuous service.

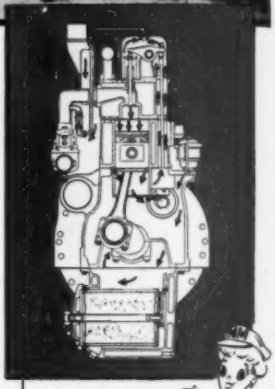
MM heavy-duty oil field engines have large diameter crankshafts, generous bearing surfaces, and heavy flywheel housing flanges that prevent deflection. Cylinder heads, removable cylinder blocks and crankcases are of thick wall design that eliminates distortion.

It is this extra margin of size and strength built into MM parts that makes them *stay put,* and makes MM engines stay on the job *longer!*

To back up this heavy-duty design under severe operating conditions, MM oil field engines have exclusive hot water jacketed base pans and metered vacuum crankcase ventilation. These features are proved by 10 years of continuous operation without major overhaul.

Get the facts about how these features prevent sludging and maintain uniform top to bottom temperature control under extremely unfavorable fuel and climatic conditions. Other MM cost-reducing features you will appreciate are the many standard parts, interchangeable on all power sizes that make possible finest precision and require minimum spare part stocks.

Quality Control **IN MM FACTORIES ASSURES DEPENDABLE PERFORMANCE ON THE JOB**



Minnie Moline's reminder: *"MM exclusive base pan and crankcase ventilation assure trouble-free operation."*

MINNEAPOLIS-MOLINE MINNEAPOLIS 1, MINNESOTA

Canadian Distributor: Disher Winslow Ltd., Edmonton, Alta.

DISTRIBUTED BY

SHRIMPTON

Manufacturing & Supply Co.

LOS ANGELES • KILGORE
Tel: Angelus 1-5122 Tel: 1241

OKLAHOMA CITY
Tel: 33254

Warner Electric Brakes give you two independent braking systems plus precision synchronization for

SAFE STRAIGHT-LINE BRAKING

Here's why more and more fleet owners are turning to Warner Electric Brakes for their truck trailers.

It's because of the important *dual* safety factor provided by this better braking system.

First—with Warner Electric Brakes on the trailer, you have *two* independent braking systems. If one should become inoperative for some reason, you still have control.

And, second—this independent *electric* trailer brake system synchronizes instantly with tractor brakes. There is no time-lag in the action at any point . . . braking is controlled and operated electrically—*with lightning speed!* Just touch the control and you have immediate response of *all* brakes at the same time . . . in the exact degree of power desired!

This precisely synchronized Warner *electric* action means smooth, *straight-line* deceleration and stops. Tractor and trailer act as a single unit to guard against skidding, diving, sliding, jack-knifing. And no other braking system equals Warner's for simplicity . . . nothing exposed to get knocked off or leak.

Thus, you have carefully engineered, *completely balanced* braking of two independent systems for double safety, double dependability to match any road or load condition.

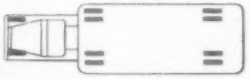
OUR 25TH YEAR—WARNER ELECTRIC BRAKE & CLUTCH COMPANY, BELOIT, WISCONSIN

WARNER

ELECTRIC BRAKES

FOR TRUCK TRAILERS

HERE'S HOW ELECTRIC



"WARNER WAY" . . . all brakes reach full power together to keep tractor and trailer in line . . . safe, straight-line braking for gradual or emergency stops.

Gulf States Truck Lines standardizing on electric brakes for greater safety

Hauling all types of equipment used in the discovery, developing, and processing of oil, Gulf States Truck Lines, Shreveport, Louisiana, first started equipping its trailers with Warner Electric Brakes in 1951.

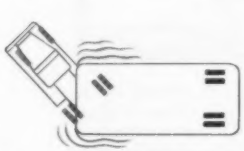
Here's what Mr. Wayne T. Benson, owner, has to say after using Warner Electric Brakes on 15 trailers, which operate over all conceivable types of terrain—in all kinds of weather:

"We have found the operation of electric brakes to be much smoother than any other type we have tried.

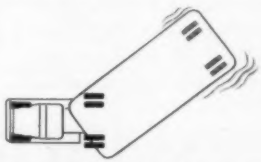
"Our safety program has incorporated in it the eventual standardizing of our trailer brakes to the electric type.

"Our drivers prefer the electric system and I am so well pleased with the Warner Electric Brake system that I am changing over to this equipment with all possible speed."

BRAKES PROTECT AGAINST JACK-KNIFING



WRONG WAY . . . when brakes aren't synchronized and tractor brakes "come in" ahead . . . jack-knife is sudden, drive wheels slide sharply. Recovery is difficult.



WRONG WAY . . . when brakes aren't synchronized and trailer brakes "build up" first . . . rear of trailer swings, then comes around into a jack-knife.

FREE! **New factual folder "Six Steps to Better Braking for Truck Trailers." Get your copy now.**

Gives important tips on driver safety through synchronized braking. Explains the precise operation, simplicity of hook-up, amazing economy and added safety features of *electric* braking. Write today. Warner Electric Brake & Clutch Company, Dept. OGJ, Beloit, Wisconsin, U. S. A.

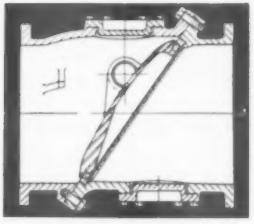
Here's the One "TILT" that Pays Off On the Level!...

the TILTING DISC in CHAPMAN'S CHECK VALVE

Yes, this is on the level . . . Chapman's Tilting Disc design offers you savings in head loss 65% to 85% over regular swing-type check valves.

For this Tilting Disc rides the flow . . . cushions itself to a quick, *quiet* closure right at the instant when there's no velocity in the line. There's no slamming, under usual pipeline arrangements. So there's no jarring of the line, no opening of the joints, no wear of moving parts worth mentioning. And seating is *drop-tight.*

Certified engineering test-results are charted in Catalog No. 30. Take a look at these tests . . . and then figure what Chapman Tilting Disc Check Valves can save for *you.* Send for your copy now.



Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

THE CHAPMAN VALVE MFG. CO., INDIAN ORCHARD, MASSACHUSETTS

Only 2 Years Old . . .

In its relatively brief history, Procon has completed or has under construction, 22 major refinery installations for refiners in the United States and overseas.

Procon jobs include UOP Platforming units, fluid catalytic cracking units, polymerization plants, feed preparation units, Udex units, and in addition, numerous turnarounds of refinery processing facilities.

but a world of experience

PROCON is only two years old, but the total experience of the organization adds up to years and years of practical construction knowledge.

Every Procon job is administered by a group that has long worked together on the installation and operation of all types of refinery processing equipment. Engineering and field work are handled by highly competent staffs, adequate in size and well-equipped in experience.

This combination provides a *complete process construction service* that has quickly made its mark in the petroleum refining and petrochemical industries.

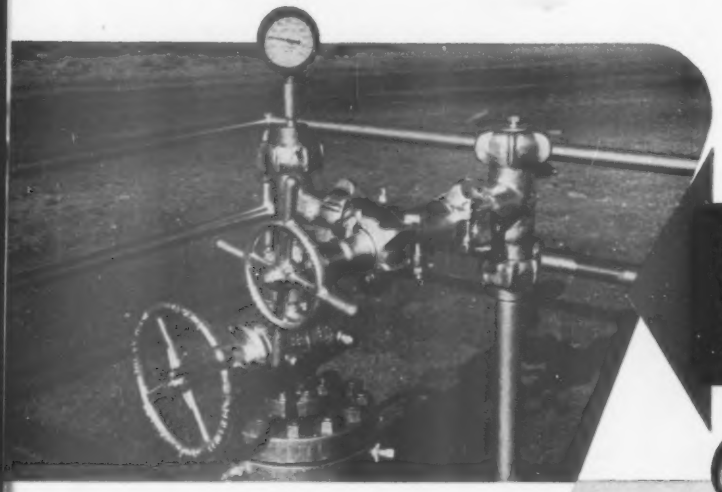
PROCON *Incorporated*

PROCESS CONSTRUCTION

75 EAST JACKSON BLVD., CHICAGO 4, ILLINOIS

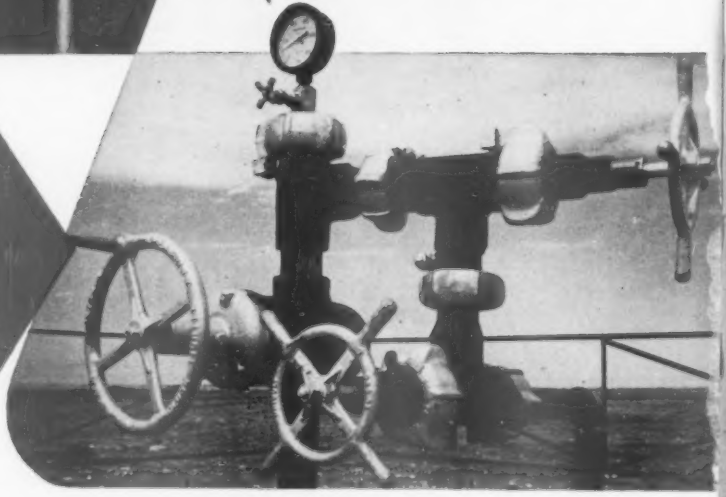
ON HIGH PRESSURES OR LOW, PRODUCTION FROM ANY WELL CAN BE BETTER CONTROLLED WITH

The new UNIBOLT ADJUSTABLE WING VALVE



On high pressure wells, IT'S A DEPENDABLE, LOW COST WING VALVE

On low pressure wells, IT'S A PRECISE, TROUBLE-FREE, ADJUSTABLE CHOKE



The UNIBOLT Wing Valve, designed originally for use as an adjustable choke where well conditions did not demand a positive choke, has become popular with production men as a dependable valve for numerous services where a positive shut-off is essential. Christmas trees for both producing and injection wells, high pressure oil and gas separator manifolds, heater manifolds, meter runs and similar services are made to order for this dependable, yet relatively low-cost, valve. Since high pressure wells are usually produced through a small positive choke, the one-inch opening provided in the UNIBOLT Wing Valve when in full open position is ample to assure unrestricted flow. An additional advantage is the replaceable stem and seat, which may be changed in the field, easily and at low cost. A recent refinement in its mechanical design is the stem packing which, after the valve is assembled at the factory, never requires adjustment or tightening.

Having standard UNIBOLT Couplings between its component parts, the UNIBOLT Wing Valve is easily dismantled or assembled, and may be readily converted to a Positive Choke Body by substituting a blanking plug and positive bean for the stem and seat assembly.

Available in 6,000, 10,000 and 15,000 lbs. test, and in corrosion resistant alloy.

THORNHILL-CRAVER COMPANY

HOUSTON TEXAS

When planning your pipe line ... plan for protection

Bitumastic 70-B Enamel being machine-applied to a 20-inch gas transmission line.

PIPE-LINE engineers are proud of their completed pipe-line projects. They are the result of careful planning, expert engineering skill and plenty of hard work. And these projects deserve the best possible protection against corrosion — the protection provided by Bitumastic Enamels.

"The best possible protection against corrosion"— this claim is based on actual service records . . . on *proved* performance. Many pipe lines are still carrying gas and oil underground, after more than 30 years good service. And these durable enamels have established these records under the most severe corrosive conditions.

Further, the experience gained by Koppers in safe-guarding thousands of miles of pipe lines against corrosion is available to you. Discuss your next pipe-line project with one of our representatives. He will give you complete details concerning Bitumastic Enamels.

Specify BITUMASTIC® ENAMEL

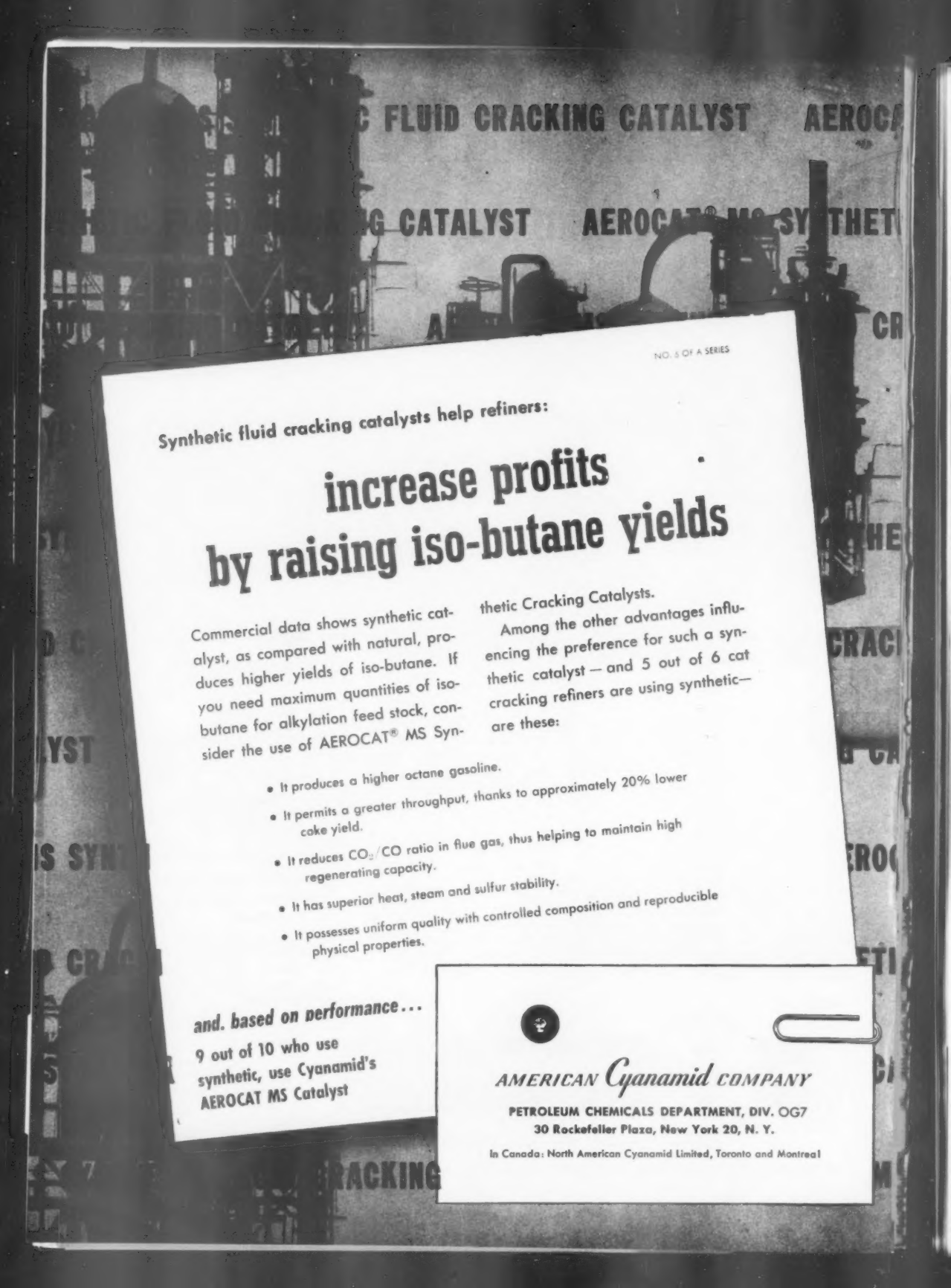
Bitumastic Enamels now available from Koppers new Fontana, California, Plant!

Koppers can now supply Bitumastic Enamels from its new plant at Fontana, California. This plant was built in order to give you better service in the west.

KOPPERS BITUMASTIC ENAMELS

KOPPERS COMPANY, INC., Tar Products Division, Dept. 803-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.



NO. 5 OF A SERIES

Synthetic fluid cracking catalysts help refiners:

increase profits by raising iso-butane yields

Commercial data shows synthetic catalyst, as compared with natural, produces higher yields of iso-butane. If you need maximum quantities of iso-butane for alkylation feed stock, consider the use of AEROCAT® MS Synthetic Cracking Catalysts.

Among the other advantages influencing the preference for such a synthetic catalyst — and 5 out of 6 cat cracking refiners are using synthetic— are these:

- It produces a higher octane gasoline.
- It permits a greater throughput, thanks to approximately 20% lower coke yield.
- It reduces CO_2/CO ratio in flue gas, thus helping to maintain high regenerating capacity.
- It has superior heat, steam and sulfur stability.
- It possesses uniform quality with controlled composition and reproducible physical properties.

and, based on performance...

9 out of 10 who use synthetic, use Cyanamid's AEROCAT MS Catalyst

AMERICAN Cyanamid COMPANY

PETROLEUM CHEMICALS DEPARTMENT, DIV. OG7
30 Rockefeller Plaza, New York 20, N. Y.

In Canada: North American Cyanamid Limited, Toronto and Montreal

They Say—

Peace Outlook Bright

"Control by the free nations of 90 per cent of the world oil supplies makes it doubtful that Russia will set off World War III until her own oil supply is improved.

"It is no mere coincidence that the trouble areas in the world are rich in oil—Iran, Egypt, Indo-China. A mechanized Army runs on oil.

"The outlook for world peace is no worse—and perhaps a little brighter—than it was more than a year ago when the Iranian Government nationalized the oil industry in that country.

"The Communists have not taken over, as many people feared at that time. The oil industries of the United States and other free nations have managed to fill the vacuum created by the loss of production from the Abadan refineries.

"Oil and rubber are two of the most necessary items to the winning of a war.

"The United States is now self sufficient as to rubber supplies—thanks to petroleum-derived rubber and its synthetic-rubber industry.

"Indispensable substitutes for natural products which could be used during wartime have been developed from oil. Included among them are synthetic rubber, textiles, plastics, detergents, glycerin, and ammonia."

From an address by Dr. Marlin M. Volz, dean of the University of Kansas City law school, at Jefferson City, Mo.

Philosophy on Investigations

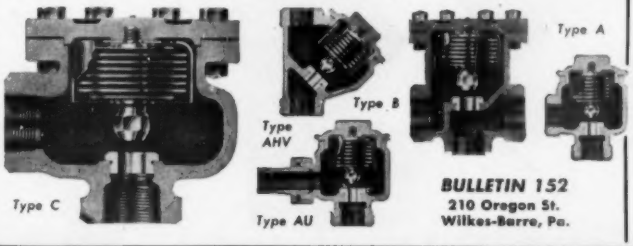
"Year after year petroleum is under investigation. Congressional committees investigate. State legislatures investigate. Committee staffs investigate, and their findings—wise or half-baked—reach the press. Regulatory bodies, commissions, and bureaus investigate. Obviously these investigations are largely repetitive. They hash and rehash the same topics. The same old charges are made. The same old myths have to be exploded. Even the dynamic petroleum industry working at top speed does not change fast enough to provide all-new acts for each performance.

"Oil men should be philosophical about these things. They should remember that, from the viewpoint of the public and its elected representatives, the units of the industry are the administrators of a natural resource asset

NICHOLSON TRAPS HELP

CUT STEAM COST $500,000 A YEAR

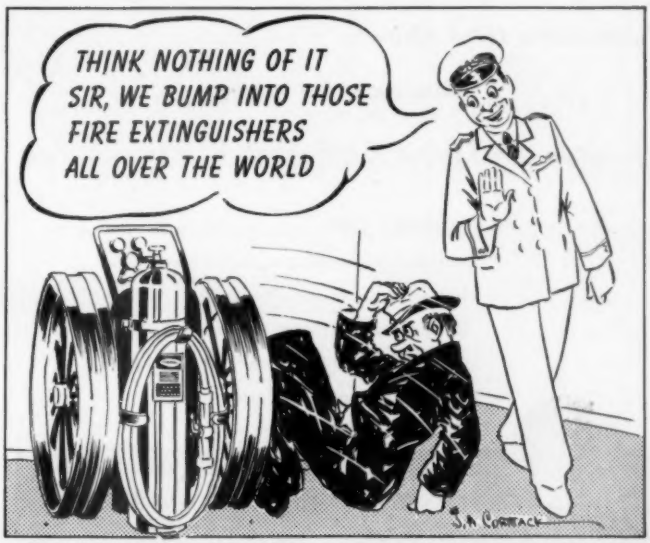
At one of the nation's large processing plants a campaign to promote economical steam use by improving heat transfer efficiency has resulted in a yearly saving of $500,000. Credit for a fair portion of this is given to improved steam trapping, which resulted from the installation of Nicholson thermostatic traps. To see why an increasing number of leading plants are standardizing on Nicholsons for positive drainage and faster heat transfer, send for Bulletin 152.



BULLETIN 152
210 Oregon St.
Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

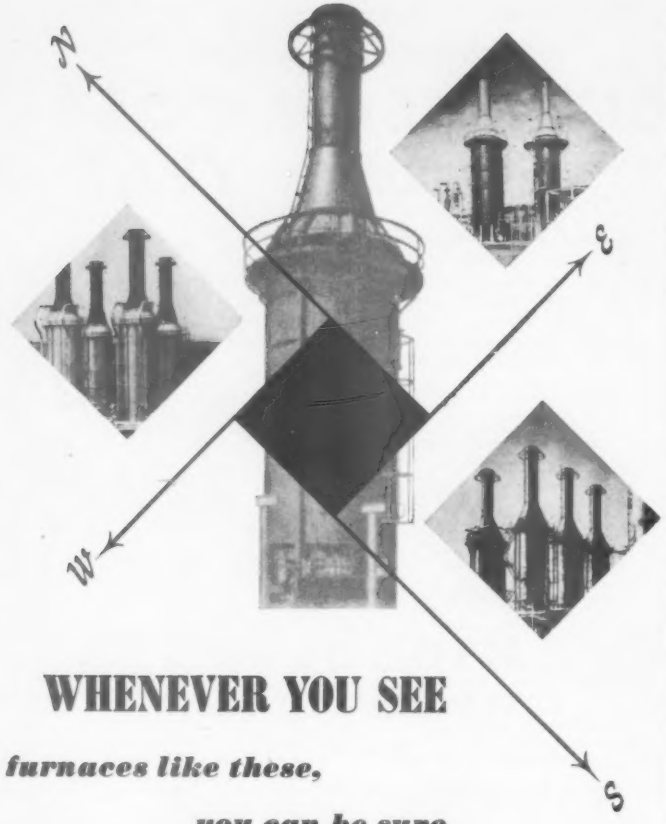
TRAPS · VALVES · FLOATS



Many thousands of Ansul Dry Chemical Fire Extinguishers are exported each year. They may be found in oil fields of Central and South America, in gold mines of South Africa, in the Arctic wastes of Iceland, Northern Canada and Alaska and even in the tropical paradises of the Dutch East Indies. In addition, airports all over the world use Ansul Equipment to protect lives and property against loss by fire.

It all goes to prove that the word gets around concerning the greater Fire-fighting effectiveness of Ansul Dry Chemical Fire Extinguishing Equipment.

SEE PAGE 415



WHENEVER YOU SEE

furnaces like these,

you can be sure

they're* PETRO-CHEM ISO-FLOW *design

More than **1000** *are in operation throughout the world in the petroleum, chemical and allied industries . . . for all processes and for any duty, pressure, temperature and efficiency . . . and all Petro-Chem Iso-Flow furnaces are pre-eminently satisfactory.*

PETRO-CHEM ISO-FLOW FURNACES

UNLIMITED IN SIZE CAPACITY DUTY

PETRO-CHEM DEVELOPMENT CO., INCORPORATED

122 EAST 42ND STREET, NEW YORK 17, N. Y.

Representatives: Bethlehem Supply, Tulsa and Houston · Flagg, Brockett & Durgin, Boston · D. D. Foster, Pittsburgh · Faville-Levally, Chicago · Lester Oberholtz, California · Gordon D. Hardin, Louisville, Kentucky

of the whole country. If they are not ashamed of their administration, they should be willing to explain it, again and again.

"If the show seems repetitive, let oil men remember John Ringling's explanation of the success of the circus. The point is, he said, every new season there are a couple of million new customers who have never seen a circus before. Investigations reflect public interest. So long as the public is interested (and it always will be) there are going to be investigations."

Bruce K. Brown, president, Pan-Am Southern Corp., speaking in New Orleans.

The Steel Stoppage

"Delay in completion of the Platte pipe line points up another of the many evils which arise from a labor tieup. The steel strike is the villian in this particular case, but there have been scores of other regrettable production stoppages which have cost the people hundreds of millions of dollars and have idled thousands of workers who would rather stay on the job and have these questions settled by orderly and legal arbitration.

"This newspaper does not know whether the Taft-Hartley law is the complete answer but we do know that it is on the books and either should be used or repealed."

Editorial in the Sydney, (Neb.), Telegraph.

Gain from the Oil Strike

"The only prospect for gain from the (oil) strike is if company managers and the union leaders will honestly admit the strike was a mistake and will honestly reexamine their policies and procedures which resulted in such a blunder.

"Such a reexamination might, hopefully, result in the discovery that warfare is not the proper attitude for company-union relationship, but that much can be accomplished for the good of both the company and the employes if a spirit of cooperation is developed.

"In most cases, the interests of the company and the interests of the employes are identical. In the few cases of opposite interests, the attitude of company managers and union leaders should be one of friendly respect for the position of the other party in the dispute.

"This will mean the end of name-calling, the substitution of reasonable debate for threats and dishonest statements. It will mean constructive, instead of destructive, labor relations."

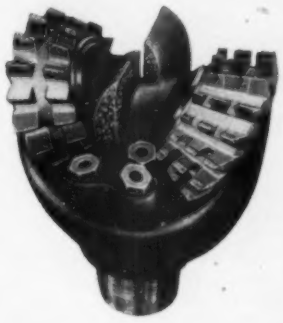
R. L. Minckler, president of General Petroleum Corp., in "Doings in General."

Accepted As The Best Surface Bit Made...

The A-1 Kinnear* Combination Bit is daily surpassing drilling requirements for making straight hole fast.

Ask the man who runs one!

A-1



Research is constant in developing new and better Combination Bits for deeper formations

* U. S. Letter Patent No. 238012 and Re-Issue No. 23416

A-1 KINNEAR COMBINATION BIT *

Write for Details Today

A-1 BIT & TOOL COMPANY

2000 HUSSION STREET • BOX 2133 • CHarter 7611 • HOUSTON

DISTRICT OFFICES AND SERVICE POINTS:

TEXAS
Beaumont
Corpus Christi
Kilgore
Midland
Victoria
Odessa

LOUISIANA
Houma
Lafayette
Lake Charles
New Orleans

OKLAHOMA
Duncan
Oklahoma City

WYOMING
Casper
W. A. Posey

NORTH DAKOTA
Tioga

MISSISSIPPI
Brookhaven

CALIFORNIA
Los Angeles
Baash-Ross Tool Co.

CANADA
Edmondton
Import Tool Co.

EXPORT REPRESENTATIVES:

SOUTH AMERICA:
C. R. Summers,
Avila Hotel,
Caracas,
Venezuela

NEW YORK, N. Y.
Beckley, Haltom & Hickman
30 Rockefeller Plaza

ARGENTINA:
Langley y Cia.
Corrientes 1115
Buenos Aires

NEAR & FAR EAST
W. O. Calvert
20 Copthall Ave.
London E. C. 2
England

MEXICO
J. E. Douglas
2nd Natl. Bank Bldg.
Houston, Texas

THE VICTAULIC® METHOD OF PIPING

EASIEST WAY TO MAKE ENDS MEET

Sizes — ¾" through 60"

TEES . . . ELBOWS . . . REDUCERS . . . the Victaulic Method features a complete line of modern, top efficiency, Full-Flow Fittings for use with world famous Victaulic Couplings!

The Victaulic Method assures a complete, modern system of piping . . . fast, efficient hook-ups that simplify and streamline construction . . . cut costs! Victaulic Couplings offer easy-to-install, leak-proof connections . . . a union at every joint . . . assured trouble-free service under pressure or vacuum. Victaulic Full-Flow Fittings specially designed for use with Victaulic Couplings provide wide adaptability and complete versatility in construction. And to make the Victaulic Method complete—"Vic-Groover" Tools groove standard pipe easily and quickly . . . provide handy, portable equipment for preparing pipe right on the job!

Try the VICTAULIC METHOD on your next piping job. New construction . . . repairs . . . alterations—you'll find that the Victaulic Method *is the easiest way to make ends meet!*

Write today for Victaulic Catalog and Engineering Manual No. 44-8F.

VICTAULIC
COMPANY OF AMERICA
P. O. Box 509 • Elizabeth, N. J.
Office and Plant: 1100 Morris Ave.
Union, N. J.
Telephone: Elizabeth 4-2147

28th VICTAULIC YEAR

California: Victaulic Inc., 727 W. 7th St., Los Angeles 14
Canada: Victaulic Co. of Canada Ltd., 406 Hopewell Ave., Toronto 10
Export: Pipe Couplings, Inc., 30 Rockefeller Plaza, N. Y. 20, N. Y.

© 1952, by Victaulic Co. of America

CALENDAR

AUG.

1- 3 Wyoming Geological Association, field trip, Big Horn basin.

4- 6 Liquefied Petroleum Gas Association, gas service school, Louisiana State University, Baton Rouge.

7- 8 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Book-Cadillac Hotel, Detroit.

11-13 Society of Automotive Engineers, national West Coast meeting, Fairmont Hotel, San Francisco.

18 Illinois Oil & Gas Association and Illinois Basin chapter of American Petroleum Institute, annual mid-summer Oil Men's Outing, Meadow Woods Country Club, Centralia, Ill.

19-22 American Institute of Electrical Engineers, Pacific general meeting, Westward Ho Hotel, Phoenix, Ariz.

25-27 Twelfth Annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPT.

1- 3 Interstate Oil Compact Commission, fall meeting, Banff, Canada.

1- 5 International Symposium on Combustion, Massachusetts Institute of Technology, Boston.

3- 5 Pacific Coast Gas Association, Ambassador Hotel, Los Angeles.

4- 5 Rocky Mountain Oil & Gas Association, refining committee, Newhouse Hotel, Salt Lake City.

8-12 Instrument Society of America, seventh national instrument conference and exhibit, Cleveland.

10-12 National Petroleum Association, fiftieth annual meeting, Hotel Traymore, Atlantic City, N. J.

11-13 American Institute of Chemical Engineers, regional meeting, Palmer House, Chicago.

12-13 Association of Desk and Derrick Clubs of North America, first annual meeting, Shamrock Hotel, Houston.

13 Seventh National Chemical Exposition, Chicago Coliseum.

24-25 Independent Petroleum Association of America, annual meeting, Skirvin Hotel, Oklahoma City.

25-26 Western Petroleum Refiners Association, regional meeting, Hotel Henning, Casper, Wyo.

29-30 American Association of Oilwell Drilling Contractors, annual meeting, Skirvin Hotel, Oklahoma City.

OCT.

1- 3 American Institute of Mining and Metallurgical Engineers, Mid-Continent fall meeting, Rice Hotel, Houston.

1- 3 National Association of Corrosion Engineers, South Central Region, technical program and committee meetings, Jung Hotel, New Orleans.

2- 3 Petroleum Electric Power Association, twenty-third annual meeting, Mayo Hotel, Tulsa.

3- 5 New Mexico Geological Society, annual field conference, Santa Fe.

4 John Zink Process Heating seminar, John Zink Co. plant, Tulsa.

6 Independent Natural Gas Association of America, annual meeting, Fontenelle Hotel, Omaha, Neb.

9-10 California Natural Gasoline Association, twenty-seventh annual fall meeting, Ambassador Hotel, Los Angeles.

13-15 Texas Mid-Continent Oil and Gas Association, thirty-third annual meeting, Hotel Texas, Fort Worth.

Water or Land...
RIGHT IN OUR STRIDE
MARINE
EXPLORATION CO.

When you're between the Devil and the deep blue sea

Call Santa Fe

Your Santa Fe freight man knows how to make your hard shipping jobs look easy—and how to handle your common jobs uncommonly well. Call him today—find out how easy it is to *ship via Santa Fe all the way!*

F. H. Rockwell, Gen. Freight Traffic Manager
Santa Fe System Lines
Chicago, Illinois

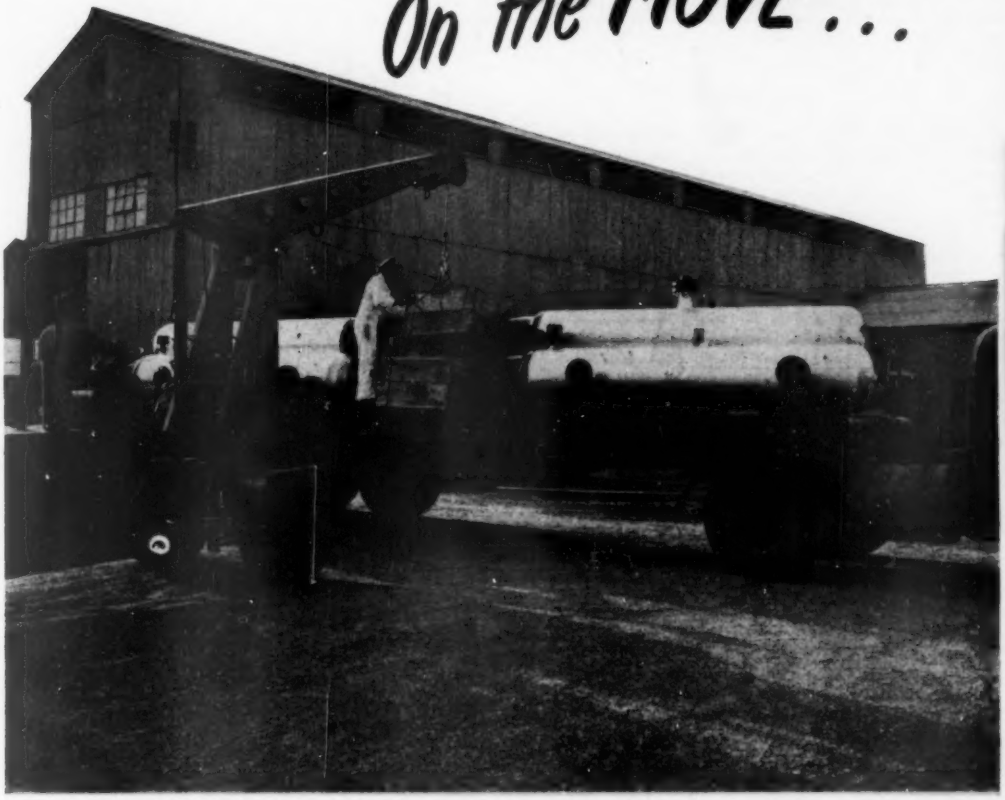
13-17 American Institute of Electrical Engineers, fall meeting, New Orleans.
16-17 Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.
16-19 Permian Basin Oil Show, Odessa, Tex.
19 Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.
22-24 Society of Automotive Engineers, national transportation meeting, Hotel William Penn, Pittsburgh, Pa.
22-24 American Institute of Mining and Metallurgical Engineers, West Coast fall meeting, petroleum branch, Statler Hotel, Los Angeles.
23-24 American Institute of Mining and Metallurgical Engineers, West Coast fall meeting, Statler Hotel, Los Angeles.
24-25 Independent Petroleum Association of America, annual membership meeting, Skirvin Hotel, Oklahoma City.
27-31 American Gas Association, annual convention, Atlantic City, N. J.
30-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, annual fall meeting of Pacific sections, Statler Hotel, Los Angeles.
30-Nov. 1 Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver.

NOV.
3- 4 Society of Automotive Engineers, national diesel engine meeting, Chase Hotel, (tentative), St. Louis, Mo.
5- 7 Industrial Management Society, 16th annual time and motion study and management clinic, Sheraton Hotel, Chicago.
6- 7 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.
6- 8 Gulf Coast Association of Geological Societies, annual fall meeting, Hotel Driscoll, Corpus Christi, Tex.
8-13 Oil Industry Information Committee, Conrad Hilton Hotel, Chicago.
10-13 American Petroleum Institute, thirty-second annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.
13-14 Society of Exploration Geophysicists, midwestern meeting, Texas Hotel, Fort Worth.
17-18 American Institute of Electrical Engineers, subcommittee on electrically operated recording and controlling instruments, technical conference, Benjamin Franklin Hotel, Philadelphia.
20-22 Instrument Maintenance Short Course, jointly sponsored by Southern California Meter Association and Los Angeles Harbor Junior College.
30-Dec. 5 American Society of Mechanical Engineers, Statler Hotel, New York City.

DEC.
1- 3 New Mexico Oil and Gas Association, annual meeting, Albuquerque.
1- 6 Twentieth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York.
5- 6 Interstate Oil Compact Commission, winter meeting, Wichita, Kans.
7 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.
7-10 American Institute of Chemical Engineers, annual meeting, Hotel Cleveland (Hqs.) and Carter Hotel, Cleveland.

PEERLESS SEPARATORS

On the MOVE...



PEERLESS SEPARATORS... the BYWORD for SEPARATION of LIQUIDS & GASES

A truckload of 24" 1000# Oil & Gas Separators being loaded for delivery to the San Juan Area in New Mexico.

Peerless offers a complete line of separators for the Petroleum industry.

They combine extremely high efficiency of separation with the finest control equipment available.

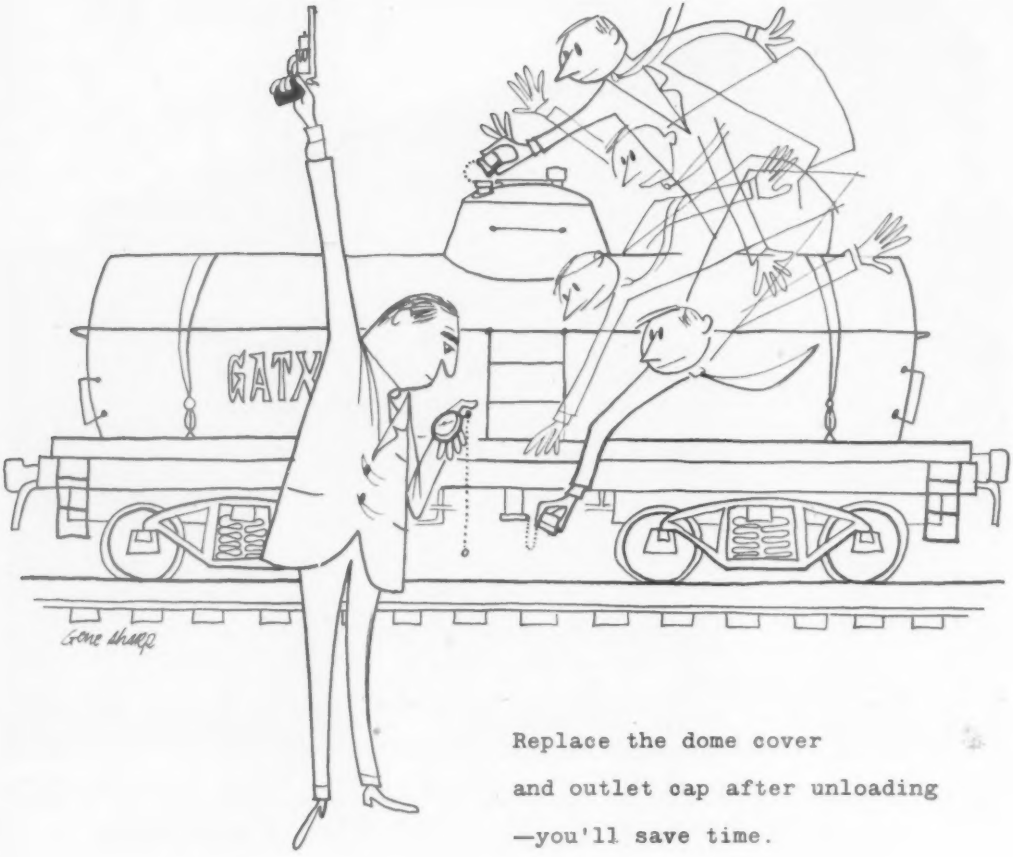
PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P O BOX 7193 ★ DALLAS, TEXAS ★ Dixon 8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

THE CARE AND NURSING OF TANK CARS



Replace the dome cover
and outlet cap after unloading
—you'll save time.

Another way to get more from your GATX tank cars

GATX GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street · Chicago 90, Illinois

District Offices: Buffalo • Cleveland • Dallas • Houston • Los Angeles • New Orleans
New York • Pittsburgh • St. Louis • San Francisco • Seattle • Tulsa • Washington
Export Dept.: 10 East 49th Street, New York 17, New York

So many people have requested reprints of these cartoon advertisements that we are making them available to you for use in your shops. Just write us.

THE OIL AND GAS
JOURNAL
TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Oklahoma. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle

●

P. C. Lauinger, President; S. H. Rourke, Executive Vice President; Mitchell Tucker, Vice President and Advertising Manager; Hanson B. Pigman, Circulation Manager; Donald W. Wilson, Manager, Industry Census Department; J. Parker Holland, Production Manager.

EDITORIAL STAFF

C. O. Willson, **Editor;** Kenneth B. Barnes, **Managing Editor;** Henry D. Ralph, **News Editor;** George H. Weber, **Refining Editor,** 500 Fifth Avenue, New York; Dahl-M. Duff, **International Editor,** 500 Fifth Avenue, New York; Gerald L. Farrar, **Engineering Editor;** Paul Reed, **Pipe-Line Editor;** W. L. Nelson, **Technical Editor.**

Associate Editors: Lynn M. Nichols, Neil Williams, R. B. Tuttle, Philip C. Ingalls, and John C. Casper.

District Editors: TULSA: Ted A. Armstrong, Joseph A. Kornfeld, John C. Reidel, William P. Sterne, Robert J. Enright, and John C. McCaslin. HOUSTON, Sterling Building: Walter Rose, and F. Lawrence Resen. LOS ANGELES, 650 South Grand Avenue: D. H. Stormont. DALLAS, Mercantile Bank Building: Carl F. Hoot. WASHINGTON, D. C., 621 Albee Building: Bertram F. Linz. MIDLAND, TEX., McClintic Building: Roy F. Carlson. CHATHAM, ONT., 35 Stanley: Victor Lauriston.

Editorial Assistants: Carolyn Carter, Tulsa; Martha Allbright, Tulsa, and Wilma Van London, Houston.

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., and Mount Pleasant, Mich.

Advertising Offices: TULSA: John D. Reilly, Mid-Continent Manager, 211 South Cheyenne; NEW YORK: Charles A. Wardley, Eastern Manager, and Robert N. Caird, Jr., Representative, 500 Fifth Avenue, Phone LOngacre 4-1750; CHICAGO: C. R. Farmer, Manager, and E. S. Klappenbach, Representative, 105 West Madison Street, Phone Central 6-2537; PITTSBURGH: Alfred M. Jones, Manager, 429 Fourth Avenue, Phone Atlantic 1-4835; HOUSTON: John M. Spears, Gulf Coast Manager, Sterling Building, Phone Charter 4626; LOS ANGELES: Donald O. Hanson, Manager, 650 South Grand Avenue, Phone Vandike 0722; ENGLAND: Harry Becker, European Representative, 111 Thorley Lane, Timperley, Cheshire, Phone Ringway 4702.

●

Subscription rate to the petroleum industry, United States and foreign, 1 year, $4.00. Single copies, 50 cents. Back copies when over a year old, one dollar. Note: Payments from outside the U.S.A. may be in the form of an international money order or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1952 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY Speaking

Strike One . . .

THE most harried individual around our shop the past few weeks has been John Casper, our chief figures man.

The reason: John had to forecast drilling activity for the Midyear Report in this issue, and the whole thing hinged pretty much on when the steel strike would be over.

John and his crew were all set to do their usual good job of predicting how many wells would be drilled, and where, during the last half of this year. They had surveyed hundreds of operators and obtained their drilling programs by areas. They rapidly tallied completion reports for the final weeks of the first half-year. They were ready to project, extrapolate, equate, adjust, and otherwise forecast by methods of more or less mathematical exactitude just what the nation's drilling program would look like during the last half.

Then the steel strike knocked their calculations for a row of Chinese slide rules. Most of the company programs were drawn up in June when the operators assumed that the steel strike would be over most any day and that its net effect would not be a tremendous loss in the supply of tubular goods needed to keep right on drilling.

But as June ran out, and July ran along, and the steel strike continued, and the deadline for this issue kept creeping inexorably closer, John got more and more fidgity and unhappy. He grabbed at headlines and haunted the news tickers for any word that the strike was ending. John doesn't like crystal balls; he wants specific figures that he can run through his calculating machine. If he knew precisely how much steel was lost to the industry by the strike he could figure pretty closely what the effect would be on drilling, but the uncertainty of the thing got him down.

Finally, as John confessed on page 208, he had to make the arbitrary assumption that the strike would be over about the first of August, and adjust his forecast on that basis. John doesn't like strikes; they mess up his calculating.

Strike Two . . .

THIS has been a bad season for forecasters, thanks to strikes. The steel strike is messing up calculations like all get out, and there are still some imponderables left over from the refinery strike of last May.

As you will see by the articles in our special section of this issue, the strikes fouled up the estimates of production and played hob with the forecasts of demand for the remainder of the year. As for refining—it would be easy to predict that refiners would speed up to recover the output lost in May, but along comes the steel strike and cuts down the demand for heavy fuel oil so drastically that a lot of refineries may have to curtail their runs for lack of storage space. What's a poor forecaster going to do with two strikes against him?

. . . But Not Out

IN spite of perhaps 2 months' loss of production of oil-country tubular goods, this will be a record year for drilling. At least that's the Journal's prediction, in black and white, in this issue.

If it weren't for the steel strike it would be a super-duper year. But drilling went on at such a pace the first half that we figure that the industry will be able to do better than 45,000 wells.

How can oil men continue to drill wells without steel? Well, of course, they can't, literally. But one of the amazing things about this amazing industry is that oil operators have always managed to drill more wells than they said they had steel for.

They stretch their inventories, use high-priced foreign goods, scrounge around for second-hand material, pull abandoned wells, use line pipe for casing, and make temporary completions with less casing and tubing than good practice dictates. Of course this sort of thing can't go on indefinitely, but—we hope—neither can the steel stoppage. But we're betting on the oil industry to drill quite a passel of wells the rest of this year by one means or another.

Henry D. Ralph

Are you Saving pennies and wasting dollars?

Unless you are using Baker "Whirling" Cementing Equipment, you probably are wasting valuable rig time in *running* and *cementing* casing.

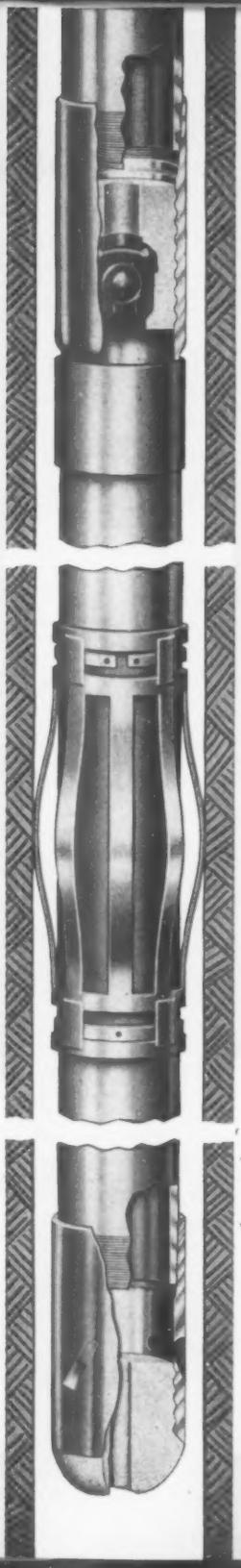
It takes mighty little wasted rig time to pay the difference in cost between ordinary shoes and Baker "Wash-Down Whirler" Shoes which do the *best* possible cementing job in the *shortest* possible time.

Here's the hook-up you need

See at right the Baker Wash-down Whirler Guide Shoe which removes bridges, conditions the hole, and whirls the cement to assure complete encasement of the casing which is centered by a Baker Casing Centralizer. If your well is extra deep, use a Baker Wash-Down Whirler *Float* Shoe in place of the *Guide* Shoe, and have two float valves in the string. The Baker Cement Float Collar, up the string, not only serves as an efficient back-pressure, or float valve, but provides a stop for the cement plug.

You won't waste *any* time with this hook-up—and see below why it is always your best bet for cementing casing.—Specify, and be sure you *get*, Baker "Whirling" Cementing Equipment.

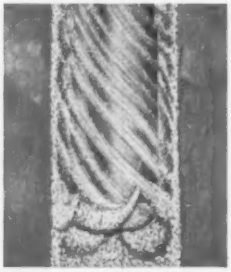
BAKER OIL TOOLS, INC.
Houston • Los Angeles • New York



Here is visual proof of what *whirling* does for you...

The downward hydraulicking action of the circulating fluid through the baffled side down-whirler ports and the restricted bottom passageway, effectively removes bridges and permits safe running of the string of casing.

When washing the formation at the cementing point to condition the hole, the "whirling" motion of the fluid helps remove mud cake from side walls. This *downward* whirling is far superior to any *side jetting* action, and does not cause caving or crumbling of soft formations.



The "whirling" motion given to the cement slurry as it is discharged from a Baker Wash-Down Whirler Shoe causes the cement to encase the centered shoe joint with a more uniform body of cement, and reduces to a minimum the hazard of channeling.

The steel strike makes oil's outlook uncertain

THE effects of strikes on the oil industry's operations can be seen readily in the series of articles in this week's Midyear Report issue.

The oil strike which closed a third of the nation's refineries for a month seriously curtailed the production of crude oil, upset the demand-supply calculations for the entire year, and threatens to result in a shortage of heating oil late next winter.

Now the steel strike, after nearly 8 weeks, is interfering with virtually all activities of the petroleum industry. Oil and gas pipe lines which were counted on for early completion may not be ready to help with the winter heating load. Refining runs are being curtailed and thrown off balance by the big drop in consumption of industrial fuel oil by steel and other plants. Construction of all types is being delayed.

DRILLING is suffering most from the steel stoppage. As supplies of tubular goods are exhausted, rigs are being stacked all over the country. This condition is certain to get worse before it gets better, because it will be many weeks after the rolling mills resume operations before workable stocks of tubular goods are adequately distributed among drillers.

Not the least of the hardships is the difficulty of making plans. The actual shortage of steel is serious, but almost as upsetting is the uncertainty over the resumption of deliveries and the tonnages which the oil industry will obtain by any given date in the future.

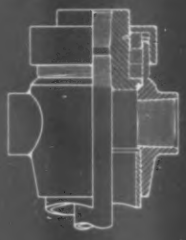
The industry's plans for expansion to meet normal demands and defense emergencies were based on rather definite assurances of deliveries of specific kinds of steel during each of the next half-dozen quarters. Now it begins to look as though the loss of 2 months' steel output will throw the expansion program out of kilter far into next year.

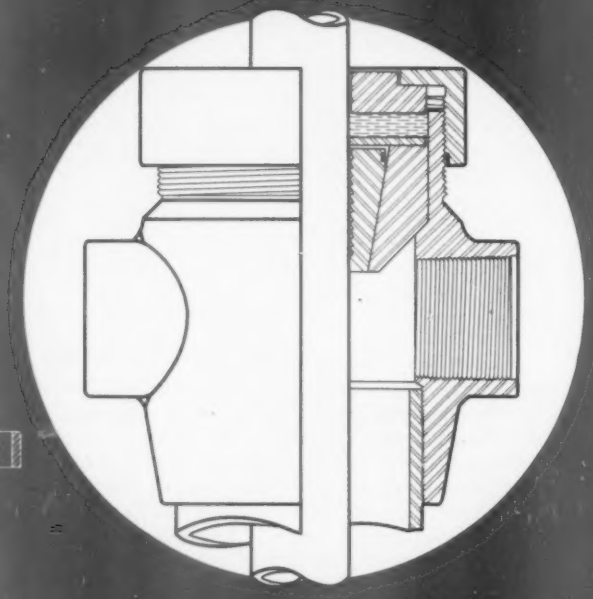
DURING its early weeks the steel strike was looked on as being generally inflationary. That is, following a short strike it was expected that markets for steel and for goods made from steel would tighten up and all business would be brisk.

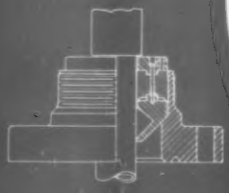
Now the feeling is that the steel strike may be deflationary, over quite a period. The production and wages lost, both in steel-making and steel-using industries, will make a tremendous dent in the nation's economy, and this may be reflected in a lessening of business activity.

Unquestionably the steel strike is having an unsettling effect on the oil industry. Its scramble for steel will be brisk enough in months to come, but its forecasts of demand for petroleum products and its plans for meeting those demands may have to be revised considerably.

HINDERLITER HW





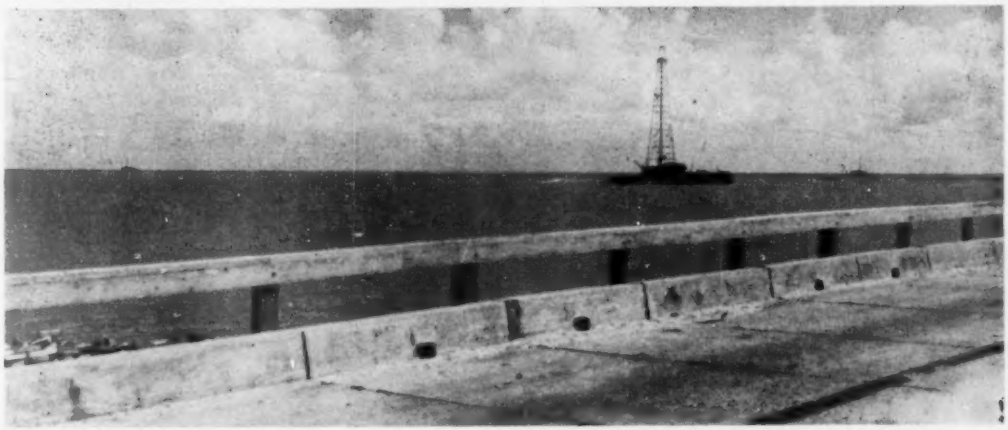


HINDERLITER TOOL COMPANY DIVISION

H. K. PORTER COMPANY, INC.

DRAWER 2650 TULSA 1, OKLAHOMA

THIS WEEK



BUSY BAYS... Eighteen rigs currently are operating in the waters of Copano Bay, Aransas Bay, and St. Charles Bay, about 20 miles north of Corpus Christi, Tex. This is an extension of the drilling activity which a year ago was concentrated in the Redfish Bay area, closer to Corpus Christi. This view shows three of the barge-mounted rigs visible from the Copano Bay causeway.

INTERNATIONAL.—Journal-compiled statistics show world production of crude oil in May suffered sharpest decline in any single month since the end of the war. . . . The drop of nearly 1,090,000 bbl. daily was due entirely to the recent oil strike in the United States. . . . Domestic production slumped to 5,200,000 bbl. daily from 6,430,000 bbl. in April. . . . ¶World Court declares it has no jurisdiction in dispute over Iranian oil nationalization, a decision sought by Premier Mossadegh and his National Front party. . . . A.I.O.C. spokesmen say the company will resume its efforts for arbitration. . . . ¶Mossadegh back as premier following threatened revolution which forced conservative Ahmad Ghavam to resign after only 4 days in office. . . . This effectively squelches hopes for a quick settlement of the nationalization issue. . . .

EXPLORATION.—Ohio Oil Co.'s deep test in Paloma field west of Bakersfield, Calif., now is drilling below 14,230 ft., making it the deepest well now drilling in the state. . . . Hole may be carried below 20,000 ft. to investigate the Eocene horizon. . . . The wildcat also will test the shallower lower Miocene and Oligocene formations. . . . ¶Williston basin geophysical activity now running at about $2,000,000 every month, with most of the crews concentrated in Montana and North Dakota portions of the basin. . . .

EARTHQUAKE.—California oil industry shaking off the effects of the state's worst quake in 40 years. . . . Pipe-line breaks and power failures, which caused hundreds of wells to be shut in, were repaired quickly, and production is about back to normal. . . . A newly modernized cycling plant in Paloma field fared less fortunately. . . . The strong earth movement there and a subsequent fire destroyed equipment valued at between $1,000,000 and $1,500,000. . . . Checks over the state have failed so far to reveal any damaged wells. . . .

GOVERNMENT.—Federal Atty. Gen. James P. McGranery says he will call a grand jury immediately to investigate congressional accusations that five American and two British oil companies have combined to control the international oil industry. . . . The revived cartel charges generally are that these firms have conspired to fix prices, allocate markets, exert pressure on governments, exclude independents from operations abroad, and injure domestic producers and consumers by importing crude into this country. . . . American firms immediately term allegations "nonsense." . . . ¶DPA approves 38 more oil and gas projects valued at $92,500,000 for accelerated tax amortization. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,082,550 bbl. daily for week ended July 19, up 1,100 bbl. daily. . . . ¶Total well completions decreased 63 wells to 878 for the week. . . . Wildcat completions for the week totaled 210 compared with 229 for previous week and 216 for same week last year. . . . ¶The fifth successive week of decreases brought total rotary rigs operating in United States down to 2,445 on July 21. . . .

TRENDS.—Stocks of four major products increased 38,765,000 bbl. in 7-week period ended July 19. . . . Additions to storage amounted to 14,428,000 bbl. more than for same weeks last year. . . . ¶Distillate stocks now are only 2,348,000 bbl. less than last year. . . . Residual stocks are 4,626,000 bbl. greater than last year. . . .

REFINING.—Gulf Coast refiners assure PAD their plants will operate at maximum capacity for next 9 months to assure adequate supplies of heating oil on the eastern seaboard next winter. . . . Plants now are operating at about 96 per cent of rated capacity. . . . By maintaining this level and putting new facilities on stream, refiners on the gulf figure they can boost distillate output by about 18 per cent over last year. . . . ¶Du Pont survey shows octane numbers of both premium and regular grades of gasoline have climbed during second quarter. . . . ¶Imperial Oil, Ltd., lets contract for a major portion of the $7,000,000 modernization program at its refinery to Fluor Corp. . . . ¶Proven Oil & Refining Co. reveals plans for Arizona refinery with initial capacity of 15,000 bbl. daily, including aviation-gasoline facilities. . . . Proven Oil was formed by backers of West Coast Pipeline Co. . . .

SIDE-HILL CUTS like the one on this mile-long stretch are a typical feature of the Trans Mountain job. Shortly after the author took this photograph, an avalanche buried the bulldozers and rooter under 10 ft. of rock. The operators saw it coming and got out of the way safely. Frequently steep slopes like this one become vertical cliffs, thereby forcing crossings of the river at left.

SHOVING OFF for scene of construction activity in a Comstock Midwestern plane are M. T. (Bill) Wilhite, general superintendent of the company, and Paul Reed, pipe-line editor of The Oil and Gas Journal.

A Pipe Line for Ripley

Trans Mountain project in Canada contends with glaciers, Rockies, swamps, plains, and bear that crawl into the pipe

Paul Reed

JASPER, Alta.—The nickname of "Inch-by-Inch" for the Trans Mountain Oil Pipeline Co. project might have been appropriate a month and a half ago when work was getting under way, but it is misleading now.

Three spreads are making rapid progress in laying pipe in the Canadian Rockies for the $82,000,000, 711-mile, 24-in. crude-oil line from Edmonton, Alta., to Vancouver, B. C.

The line will be ready for operation in the fall of 1953.

Canadian Bechtel, Ltd.., manages engineering and construction as representative for Trans Mountain. Comstock Midwestern, Ltd., has two-thirds of the pipe laying and Mannix, Ltd., one-third. The two contractors have $5,000,000 in equipment for the three spreads.

Tough sections . . . The toughest sections are now being laid by two spreads of Comstock Midwestern, Ltd., the contracting firm operating near Jasper where Clark C. Bledsoe, vice president, and M. T. (Bill) Wilhite, general superintendent, are running the job.

Most spectacular is the location of this work between snowcapped mountains and glaciers. The pipe line runs along the sides of a steep valley, where tractors sometimes have been buried by sudden avalanches. The steepness of the slopes frequently forces the right-of-way to cross cascading streams and even swamps to the other side of the narrow valley. Then it crosses back again, zigzagging for spots which are practicable for construction.

Rarely does it cross a foothill ridge. Largely it follows shelves along the sides of precipices. Where it dives into steep canyons, the job sometimes looks more like chimney building than pipe lining. And, strangely enough, in the same valley the line crosses swamps, one of them 9,000 ft. long.

Wilderness . . . This is a wilderness where bear have to be routed out of the pipe in the morning. Bear, deer, elk, and moose are seen frequently. Sometimes the project is called the "Ripley Believe It or Not" line. It promises to be the most visited pipeline project in the next 2 years, particularly since Jasper is a well-established summer resort for tourists.

The work differs from tough mountain pipe lining in the United States—exemplified by conditions in West Virginia and Kentucky where lines commonly follow the tops of ridges or cross over from one valley to the next. Such routing is impossible in the Canadian Rockies, because the mountain tops are alpine.

No other project has been built with such long side-hill cuts. Single side-hill cuts are as long as a mile with a rock face as high as 40 ft. Comstock Midwestern's sections have 85 miles of the 135 miles of side-hill cuts for the entire Trans Mountain project.

Right-of-way clearing goes through timber so dense that trees must be cut with the power saws to fall inward. Twenty bulldozers for a single Comstock Midwestern gang is probably a world's record.

Because of the rough terrain nearly 100 per cent of the ditching is being done by back hoes. There is little chance for a ditching machine. Double jointing of pipe to form 60-ft. lengths has speeded up pipe-gang operations.

Camp on wheels . . . Comstock Midwestern started two spreads back-to-back going east and west from Moose River in Yellowhead Pass. These spreads are supervised by two brothers, John Work and E. H. Work. Personnel for the eastern spread is based at Jasper, while the western spread is living in a camp on wheels with 46 company trailers. These include 1 for a hospital, 2 for kitchens, 4 for diners, 1 for deep-freeze refrigeration 4 for showers, and 36 for sleeping quarters. The spread office is in a box car at a railroad siding.

PIPE GANG operating near Comstock Midwestern's camp at Redpass, B. C., in the Rockies.

Eastern end . . . While the 431 miles west of Jasper is through the valley of a mountain wilderness, the eastern 200 miles is across rolling timber, muskeg, and flat wheat land. Even more rugged than the Jasper terrain is the section through the deep and narrow Coquihalla Canyon westward in the Hope, B. C., area where Comstock Midwestern will be laying pipe next year. At the extreme western end the line goes through 80 miles of the fertile Fraser River Valley.

Southwest of Jasper the Mannix, Ltd., spread at Vavenby, B. C., is working in rugged country resembling West Virginia but not as rugged as the alpine pipe lining of Comstock Midwestern near Jasper.

In the first month and a half, since the work started about June 1, the three spreads have laid approximately 60 miles. As the work goes on, progress is accelerated. Even in the difficult terrain of the Comstock Midwestern operations it is expected that the firm's two spreads will be laying at the rate of approximately 10,000 ft. per day. On July 9 one spread welded 9,000 ft. On July 10, both Comstock Midwestern spreads welded 12,000 ft. Mannix expects to progress at the rate of 4,000 ft. daily.

Pipe deliveries have been in advance of requirements, but so far only 240 miles of pipe is in sight for the project his year until the steel strike is settled.

Pipe is furnished by Kaiser Steel Corp., Consolidated Western Steel, and A. O. Smith Corp. Canadian Parkhill, Ltd., has contracted for the stringing of 473 miles of pipe. Arrow Transfer Co., Ltd., has contracted the remainder of the stringing.

Personnel . . . Trans Mountain, which is headed by Robert L. Bridges, president, and S. D. Bechtel, chairman of the board, has headquarters offices at Toronto. The company has been formed by a group including Standard Oil Co. of California, Imperial Oil, Ltd., Shell Oil Co. of Canada, Ltd., and Gulf Oil Corp., each of which owns 8⅓ per cent of the stock. In addition, stock is held by Union Oil Co. of California, Richfield Oil Corp., and 20 independent producers in Canada.

Canadian Bechtel, Ltd., has headquarters at 425 Howe St., Vancouver, B. C. This firm is headed by Van W. Rosendahl, president. Donald L. Roberts is vice president and project manager; C. E. Barker, construction manager; Ralph F. Hamilton, manager of engineering; J. Don Creveling, lands manager; W. C. Ralston, administration manager; J. H. Burroughs, general superintendent; Robert Southerland, supervisor at Jasper; B. W. Moore, supervisor at Redpass; and Arthur Rigby, supervisor at Vavenby.

Comstock Midwestern, Ltd., with headquarters at Toronto, has been formed by members of two leading Canadian and American engineering and construction firms.

Charles C. Rathgeb, Sr., is president; F. E. Stanley, chairman of the board; C. C. Bledsoe, vice president; Charles Rathgeb, Jr., vice president; William Baldwin, secretary and treasurer.

Mannix, Ltd., headquarters is at Calgary, Alta. The company's operations are supervised at Vavenby by C. P. Baker, assistant to the general manager. R. C. Wilkerson is spread superintendent.

More than 85 per cent of the engineering and construction work is being done by Canadians, both in the supervisory and contracting organizations. Extensive use has been made of the services of Canadian engineering firms and the products of Canadian manufacturers.

Imperial Starts Expansion

REGINA, Sask.—Imperial Oil, Ltd., has let contract for a major portion of the $7,000,000 modernization program at its refinery here to Fluor Corp.

The contract includes construction of a 7,500-bbl. fluid cat cracker, a vacuum-distillation unit with a 9,000-bbl. capacity, and a light-ends plant.

Fluor says it intends to subcontract a considerable portion of the work to western Canadian firms. Construction is expected to begin late this year and be completed by the spring of 1954. Clearing and preparation of the site already have started.

The program is being carried out on the refinery's present 255-acre site. It will raise refinery capacity from 20,000 to 22,500 bbl. daily.

ROCKY MOUNTAIN

Geophysical Surge

Williston basin activity runs $2,000,000 monthly

DENVER.—The Williston basin is being investigated geophysically to the tune of about $2,000,000 every month.

Most of this intensive activity is being carried out in the Montana and North Dakota portions of the basin.

There are 118 seismic, gravity meter, and magnetometer parties now working in the basin, according to Petroleum Information. A conservative estimate of the cost involved in keeping a seismograph crew in the field is $20,000 per month.

The 118 crews now working are about double the peak reached late last year. Breakdown for week ended July 3 there were 64 crews in Montana, 53 in North Dakota. These included 11 gravity-meter parties, 7 in Montana, 4 in North Dakota, and 2 magnetometer operations.

Montana activity is centered largely in the area of the state east of Range 40e, and in North Dakota west of Range 90w, with a few crews scattered as far east as 66w.

Shell Oil Co. leads in Montana activity, reporting six crews active. Sohio, Stanolind Oil & Gas Co., The California Co., and Union Oil Co. of California each report four parties in Montana.

Stanolind Oil & Gas Co. has nine active crews in North Dakota, Magnolia Petroleum Co. reports six, Sun Oil Co. five, and Amerada Petroleum Corp. three.

Quake Damage Assessed

California oil industry recovering from damage resulting from strongest shock in 40 years; Paloma area hardest hit

D. H. Stormont

LOS ANGELES.—Aside from gas-cycling operations in Paloma field, California's oil industry was almost fully recovered at week's end from damage inflicted by the severe earthquake which rocked the state.

Power failures and line breaks caused hundreds of wells to be shut in temporarily, and a few gas processing plants and refineries were shut in while checks were made to see if any facilities were damaged. This was primarily at fields and facilities in the southeast end of San Joaquin Valley, only about 30 miles from the quake's epicenter.

General Petroleum Corp. and Richfield Oil Corp., both experienced breaks in their trunk lines carrying San Joaquin and Cuyama crudes to Los Angeles. Land slides on U. S. Highway 99 hampered operations, but the breaks were repaired in short order.

Paloma hard hit . . . Hardest hit was the Paloma unit cycling plant operated by Western Gulf Oil Co. Ruptures in incoming gas lines resulted in a fire which destroyed a large part of the new gas-processing facilities added about a year ago. Five storage spheres, toppled from their foundations by the jolt, also were destroyed by fire, as was one cooling tower and a portion of another. Early estimates place plant damage at between $1,000,000 and $1,500,000.

All oil and condensate-processing operations at Paloma were shut in shortly after the quake. Western Gulf officials believe production of black oil, amounting to about 8,500 bbl. daily, will be restored in about 30 days.

All cycling operations, which result in the production of about 3,000 bbl. of debutanized condensate daily, will be suspended until the plant can be rebuilt.

No well damage . . . There as yet has been no report of wells being damaged by the quake, which is said to be the most severe in more than 40 years.

For a short time after the fire broke out at the Paloma plant, however, all producing wells in Paloma, Strand, North and South Coles Levee, and Ten Section were shut in as a safety measure.

Power failure also caused pumping operations to cease at hundreds of other wells, particularly in the Bakersfield and Ventura regions.

Checks of producers in the harbor area of Wilmington field, where minor tremors and earth slippage have damaged hundreds of producers in the past 4 years, failed to reveal any damaged wells.

New Wilmington Drilling

LONG BEACH. — A new drilling program planned by the city of Long Beach for its Terminal Island oil properties in Wilmington field calls for 146 new wells and 18 redrills.

Of the new wells 99 are to be drilled by Long Beach Oil Development Co. and 47 by Richfield Oil Corp. The former is scheduled to complete 16 of the redrills, made necessary by earth slippage at the 1,500 to 2,300-ft. level. Both companies act as contractors for the city in drilling and producing the city-owned properties.

It is planned that L.B.O.D. would complete its program by September 1953 and Richfield by January 1954. None of the wells are to be bottomed within 400 ft. of the "stipulated" line, Frank Hardesty, chief engineer for the Long Beach Harbor Commission, said in announcing the program.

Sunset Buys Tejon Hills

BAKERSFIELD.—Sunset Oil Corp. has purchased the Tejon Hills properties of Tejon Hills Oil Co. for $2,300,000.

The 1,620-acre lease involved has 22 wells with a current production of about 700 bbl. daily. The new owners plan to drill 25 additional wells at the rate of 4 or 5 monthly and also expect to drill several exploratory tests on the lease. The wells all produce from the unusually shallow depth of 400 to 600 ft., yielding crude of approximately 30° gravity.

The Tejon Hills company was comprised of three partners, Fred Miller, Richard Nance, and Julies Fried, who in 1948 drilled the wildcat which discovered the Tejon Hills field. The partners reportedly put up $5,000 apiece to drill the wildcat. Since its completion the properties have produced approximately 600,000 bbl. of crude.

Deep Test at 14,230 Ft.

BAKERSFIELD. — Ohio Oil Co.'s deep test in Paloma field west of here has reached a depth of 14,230 ft. and as such is the deepest well now drilling in California.

Drilled to investigate deep-pay possibilities in the field, the hole may be carried to below 20,000 ft. if all goes well. The wildcat, 72-4 Kern County Land, is searching for lower Miocene and Oligocene and Eocene production. The latter is expected to be encountered below 20,000 ft.

Progress on the well, which was spudded last October has been slow in recent months because of extremely hard shales. While drilling at 13,800 ft. a hot, high-pressure water sand was encountered which required use of 120-lb. mud. Current drilling is being carried out with a 117-lb. oil-base mud.

Cram Is Guest Speaker

LOS ANGELES.—Ira H. Cram, vice president of Continental Oil Co., Houston, will be guest speaker at the annual fall meeting of the Pacific Coast sections of the American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists.

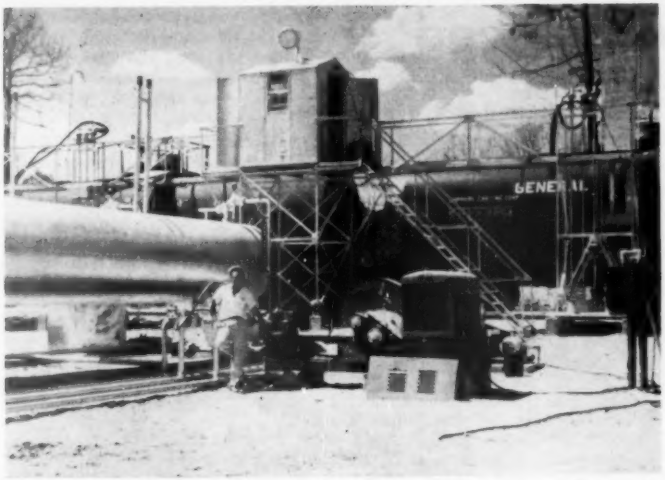
The meeting, preliminary program for which has not yet been announced, is to be held here in the new Statler Hotel October 30-31.

Cleveland Oil Selling Out

GRAND RAPIDS, Mich.—W. H. Geis, California geologist, has calculated that crude-oil reserves of Cleveland Oil Co. of Los Angeles are approximately 4,500,000 net barrels at the present time, including those both developed and undeveloped.

The disclosure was made during negotiations between the company and Great Lakes Oil & Chemical Co., which has completed plans for acquisition of all Cleveland Oil's stock.

Principal acreage is located in Wilmington, Barsdale, Kern River, Edison, and Inglewood fields of California. Forty-six wells in these fields are producing 600 bbl. of oil daily.



SURGE DRUM and loading rack operated in conjunction with General Gas Corp.'s storage project at Gibsland.

Cure for L.P.G. Headache

Operators are turning to underground storage as remedy to plaguing summer surpluses; here's how one did it

SHREVEPORT. — The number of L.P.G. underground-storage projects in the salt-dome areas has increased spectacularly since operators have found that this is a ready-made answer to the winter shortage-summer surplus problem. *(The Oil & Gas Journal, July 14, page 70).*

Here is how one of these underground cavities was created and how it works.

During the past year General Gas Corp. has been operating a typical project at Gibsland in Bienville Parish, Louisiana, about 40 miles east of Shreveport.

The company, a distributor of L.P.G. in Texas, Louisiana, and Mississippi, has two storage wells in Gibsland salt dome—one of 30,000-bbl. capacity for propane, the other of 80,000-bbl. in which L.P.G. mix is being stored.

The project was started in April 1951, and injection was carried out in July of that year. Ultimate capacity of these two cavities is to be 100,000 bbl. each, following additional washing out.

Creating the reservoir . . . Wells were drilled and pipe set in much the same manner as described previously for reservoirs created in salt beds in the Permian basin *(The Oil & Gas Journal, April 19, 1951, page 167).* Drilling was conducted through cap rock to the top of the salt at 1,090 ft. About 1,000 ft. of open hole was drilled and pipe set and cemented.

Tubing was then set, and fresh water circulated at the rate of 1,000 bbl. per day. In washing out the reservoir fresh water was injected through the tubing, displacing water through the annulus. Salt water was returned to a disposal pond. After washing out the reservoir to desired size, as determined by caliper surveys, salt water was displaced by injecting propane or L.P.G. through the annulus.

Fresh water was obtained from Gibs creek, which runs through the property. In the washing-out operating saturation was attained much faster than in salt beds, since the salt in the dome was more uniform and did not contain red bed and anhydrite stringers, which are present in Permian basin saline sections.

Reproducing L.P.G. . . . To recover the stored hydrocarbons, water is pumped through the tubing displacing L.P.G. through the annulus. It was found necessary to employ a bauxite dehydrator to dry the propane. However, the L.P.G. does not require any treatment.

A railroad spur track and 10-car loading rack are part of the General Gas Corp. installation, along with two 6,000-gal. surge tanks. Tank cars unload through hoses to surge drums.

Refiners Cooperate

Runs will be kept high to fill East's fuel-oil needs

HOUSTON.—Gulf Coast refiners will operate at maximum capacity during the next 9 months to assure an adequate supply of heating oil for the East Coast next winter.

Representatives of 12 major refiners in this area gave this assurance to C. E. Davis, head of the refining division of the Petroleum Administration for Defense, at a meeting here July 21. PAD officials will hold a similar conference with East Coast refiners in New York July 30.

To top 1951 . . . By continuing to operate plants at the current level of about 96 per cent of rated capacity and by putting on stream new facilities due for early completion, Gulf Coast refineries will be able to increase crude runs sufficiently to raise the output of distillate fuels by 18 per cent over last year's production.

The refiners' representatives expressed concern over the increasing stocks of residual fuel oil which must accompany a higher production of distillate fuels, but it was agreed that a special effort must be made to achieve the PAD objective in view of the severity of the situation.

Davis pointed out that current refinery runs in PAD Districts 1 and 3 (East Coast and Gulf Coast) are about 3,725,000 bbl. daily, or 246,000 bbl. daily over a year ago. If runs can average 3,864,000 bbl. daily, or 285,000 bbl. daily over last year, next winter's demands for distillates should be met.

Louisiana Cuts Allowable

BATON ROUGE.—The Louisiana Department of Conservation has ordered a cutback in oil-production allowables of 4,530 bbl. daily for the state in August.

The allowable figure for August was set last week at 670,812 bbl. daily. Of the total, 557,340 bbl. was allotted to South Louisiana, 113,472. bbl. daily to North Louisiana. The total breaks down to 631,812 bbl. of crude and 53,800 bbl. of other liquids.

Cartel Charge Revived

Flurry of accusations and calls for action in Congress lead McGranery to announce impending grand-jury summons

WASHINGTON.—Charges of an international oil cartel were flying freely around the capital last week.

The antimonopoly subcommittee of the Senate's small business committee held a preliminary hearing which resulted chiefly in criticism of administration officials for holding up release of the report on the subject prepared some time ago by the staff of the Federal Trade Commission.

Sen. Thomas C. Hennings of Missouri called for creation of a special congressional committee to investigate oil operations abroad and to formulate a national oil policy. In a lengthy statement he repeated many allegations of monopolistic foreign oil practices which have been made from time to time during the past dozen years.

To call grand jury . . . Atty. Gen. James P. McGranery announced that a grand jury will be called in the District of Columbia immediately to investigate such charges and will be asked to seek both criminal and civil action against five American and two British oil companies operating abroad if violations of antitrust laws are uncovered.

In general the charges are that the seven big companies which produce the bulk of the world's oil outside of the United States have conspired to fix prices and allocate markets, exert undue influence on various governments, keep independent operators from entering production activities abroad, and injure United States producers and consumers by imports of crude to this country.

Congressional committees have reviewed similar allegations at various times in the past. The companies involved have always denied the charges vigorously and so successfully that no action has even been taken against them.

The companies named by Hennings and McGranery are Standard Oil Co. (N.J.), Socony-Vacuum Oil Co., Inc., Standard Oil Co. of California, The Texas Co., Gulf Oil Corp., Anglo-Iranian Oil Co., and the Royal Dutch-Shell Group.

Called nonsense . . . Spokesmen for all five American companies immediately characterized the charges as "nonsense" and a revival of allegations which have been disproved in the past. They asserted that their foreign operations have been conducted openly, with the full knowledge of officials of the United States Government and any others interested and in compliance with all laws of this and other countries.

Typical was the comment of Eugene Holman, president of Jersey Standard: "We hope the investigation will, once and for all, put a stop to loose and irresponsible talk about this company's foreign business. We do not believe there is an 'international oil cartel'—certainly we are not a party to one."

PAD ired . . . J. Ed Warren, deputy director of the Petroleum Administration for Defense, attacked one of Hennings' statements which alleged that PAD is "an obvious partisan advocate" for the foreign operators. Warren said such a statement could not have been made if full information had been known concerning the operations of PAD.

One of the charges against the foreign operators is that the Mutual Security Agency has been overcharged by $50,000,000 on shipments of Middle East oil to western Europe. This is part of the lengthy controversy over the practice of pricing Middle East oil on the basis of prices prevailing at Gulf of Mexico and Caribbean ports plus tanker rates to Europe.

Hennings' lengthy statement made much of the allegation that American funds for the economic aid of Europe are swelling the profits of what he called the "Big Seven" by reason of this price structure for Middle East oil. He also declared that this permits the American members of the alleged cartel to import Middle East crude into the United States for their own use at extremely low cost.

New Projects Approved

Latest list of facilities approved by DPA for fast tax amortization include 38 for oil valued at $92,500,000

WASHINGTON.—Ten gasoline projects to cost $28,000,000, a $44,000,000 gas transmission project, a $5,000,000 oil pipe line, and a storage project almost as large topped a list of 38 industry projects valued at close to $92,500,000 for which certificates for accelerated amortization were granted by the Defense Production Administration during the 2 weeks ended July 10.

Topping the list was a $9,579,000 plant for gasoline production to be built in Charles Parish, Louisiana, by The Texas Co., for which quick write-off was granted on 65 per cent of $5,225,000, 40 per cent on $181,000, and 25 per cent on $4,173,000.

A second large plant is to be built at Wilmington, Calif., by Shell Oil Co., which was granted 65 per cent of $325,000, 45 per cent of $1,175,000, and 25 per cent of the remaining $5,500,000, of the $7,000,000 investment.

The big gas-transmission project is the $43,936,047 system planned by Texas Gas Transmission Corp., which was granted 25 per cent amortization.

Next in size of investment was a $5,068,790 oil line to be built by Texas Pipe Line Co., et al., for which accelerated amortization was granted on 40 per cent of $1,156,200 and 25 per cent of $3,912,590.

The big storage project, to cost $4,988,000, is planned by Esso Standard Oil Co. at Bayway, N. J., and was granted amortization on 40 per cent of investment.

Other gasoline facilities . . . Other gasoline projects approved by DPA were for Pan American Refining Corp. at Texas City, Tex., granted 90 per cent of $2,128,000 and 50 per cent of $567,000; Humble Oil & Refining Co. at Baytown, Tex.; 50 per cent of $1,415,000 and 25 per cent of $835,000; The Texas Co. at Port Arthur, Tex., 65 per cent of $1,817,000 and 50 per cent of $383,000.

Lakeside Refining Co. at Kalamazoo, Mich., 65 per cent of $1,218,000 and 40 per cent of $205,000; Sinclair Refining Co. at Marcus Hook, Pa., 65 per cent of $820,000 and 45 per cent of $150,000; Cotton Valley Solvents, Inc., at Cotton Valley, La., 65 per cent of $111,850 and 40 per cent of $272,993; Lion Oil Co., et al., in Scurry County, Texas, 65 per cent of $545,720.

Shell Oil Co. at Dillard, Okla., 65 per cent of $187,800, 50 per cent of $16,100, 40 per cent of $130,000, and 30 per cent of $45,100; Pan-Am Southern Corp. at El Dorado, Ark., 65 per cent of $145,000, and 50 per cent of $35,000; Cities Service Oil Co. (Pa.) at Linden, N. J., 40 per cent of $133,000; Shallow Water Refining Co. at Garden City, Kans., 65 per cent of $77,574, 40 per cent of $100,000, and 15 per cent of $62,000; Magnolia Petroleum Co. at Beaumont, Tex., 65 per cent of $1,705,000 and 40 per cent of $295,000; and Shell Oil Co. at Brea, Calif., 65 per cent of $473,880 and 35 per cent of $76,120.

Other processing . . . Other processing projects were approved for Phillips Petroleum Co. for natural gasoline in West Texas, 25 per cent of $830,400; McKamie Gas Cleaning Co. for propane at Magnolia, Ark., 65 per cent of $75,000 and 40 per cent of $40,000, and J. M. Huber Corp. for natural gasoline in Hutchinson County, Texas, 65 per cent of $55,200 and 40 per cent of $8,730.

Natural-gas projects included: The Texas Co. in St. Mary Parish, La., 50 per cent of $429,400; and Warren Petroleum Corp. at Lindsay, Okla., 25 per cent of $83,836.

Storage . . . Storage projects were approved for Hess Terminal Corp. at Galena Park (Houston), Tex., for 65 per cent of a $500,000 investment; Hewitt Oil Terminal, North Charleston, S. C., 60 per cent of $451,797; and Hess, Inc., at Perth Amboy, N. J., 55 per cent of $520,000.

Other storage projects, granted amortization on 40 per cent, included those of Socony-Vacuum Oil Co., $124,300 at Newburgh, N. Y., and $481,500 in Indiana; Cities Service Oil Co., $362,100 on Petty's Island, N. Y.; The Texas Co., $298,600 at Allentown, Pa.; Cities Service Refining Co., $275,000 at Lake Charles, La.; Barnhart Hydrocarbon Corp., $28,435 at Big Lake, Tex.; Socony-Vacuum Oil Co., $125,300 at Springfield, Mass., and $149,200 at Poughkeepsie, N. Y.; and Wisconsin Petroleum Terminals Corp., $225,200 at Milwaukee.

Pipe Lines . . . The pipe-line projects included a crude line for Gulf Refining Co. at Lucas, Tex., 25 per cent of $1,951,400; two projects of Montana-Dakota Utilities Co., one for transmission facilities at Rapid City, S. D., 50 per cent of $146,404, and the other a gas line in Butte County, S. D., 25 per cent of $705,332; and a crude line for Phillips Pipe Line Co., 40 per cent of $433,620 and 25 per cent of $1,412,380.

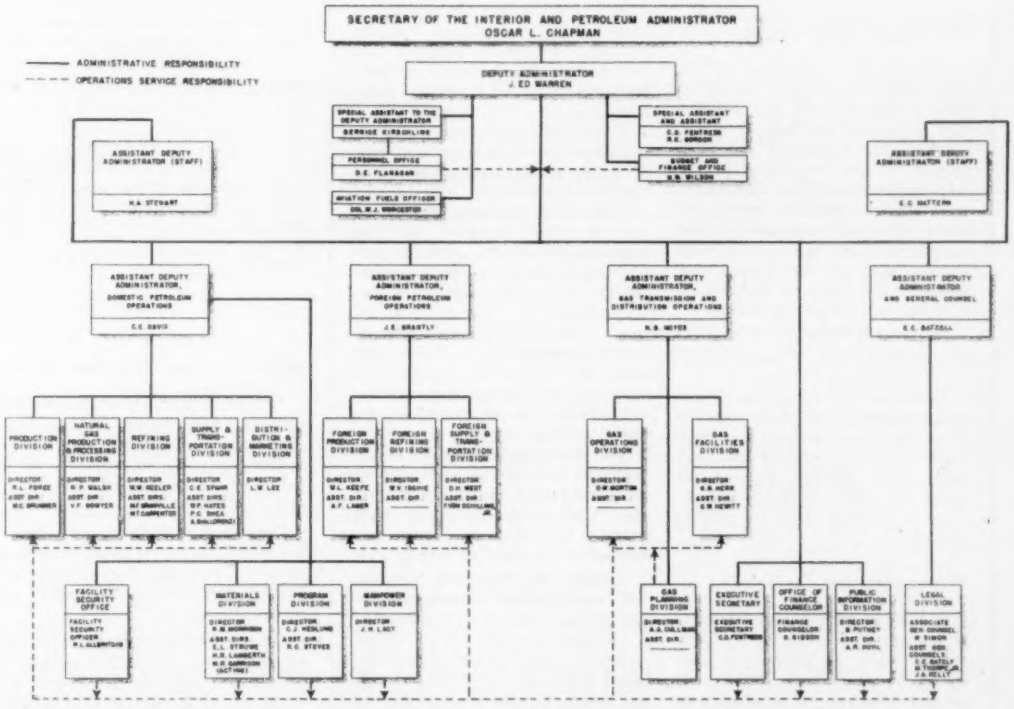
Progress Reports Simplified

WASHINGTON.—Requirements for reports on the progress of oil and gas-construction projects have been simplified by the Petroleum Administration for Defense.

Instead of the detailed monthly reports on the use of controlled materials and critical equipment required in the past, operators with projects requiring more than $500,000 in materials and equipment hereafter will make only general progress reports on Section I of PAD-26 Supplement.

These reports are to include information on engineering and design; receipt of controlled materials and criti-

PETROLEUM ADMINISTRATION FOR DEFENSE



PAD SETUP as of now is shown in this new organization chart, the latest issued by the agency. Under its policy of rotating men from the industry, PAD's personnel changes frequently, but the allocation of work and authority among divisions remains the same.

WATCHING WASHINGTON

Bertram F. Linz

Shades of Aleman

Election of Adolfo Ruiz Cortines as the next president of Mexico means the continuance for the next 6 years of the policies of President Aleman.

Cortines, who was minister of the interior in Aleman's cabinet, ran on the Aleman platform, including the control of foreign investments which he promised to permit "upon an equal plane, without discrimination, with our national elements and within the framework of the constitution."

The next head of the Mexican Government is 61 years old. As a young man he took an active part in the revolution against General Huerta and at the close of his military service entered the government as a member of the council of the bureau of statistics. He later entered politics and in 1944 was elected governor of the State of Veracruz. He joined the Aleman cabinet in 1948.

No Steel—Lost Wells

Government economists see the steel strike as having a bullish effect on industry and markets if it isn't strung out too long.

They point out that the interruption of steel supplies is permitting manufacturers and distributors to work off excessive inventories which have had a depressing effect on prices. Some lines, automobiles among them, were not greatly overstocked, and there a backlog of business will build up which will keep plants running full speed for a considerable time after settlement of the strike.

However, it is in areas like oil and gas production, where steel is "used up" like fuel, that the interruption of supply works a real hardship. Other facilities may be delayed, but wells are being lost because of inability to get the steel to drill them.

Viewpoint on Cartels

With congressional committees reviewing the Federal Trade Commission study of international cartels in the oil industry, considerable interest attaches to a report on foreign legislation on monopoly and cartel practices prepared by the State Department.

The department report indicates that monopoly and cartels are not viewed in most foreign countries with the same abhorrence as in the United States. Since the war, however, some of the European and other countries have attempted to write antitrust legislation, spurred by the Economic Cooperation Administration, the United Nations, and the Schuman plan. So far there hasn't been time to assess its effectiveness.

On the whole, the report indicates, the European countries have long been accustomed to the concentration of economic power and control of competition, and in some of them there is no great urge, even on the part of labor, to change this historic pattern.

The economic development of Asia followed similar lines because of the predominant part played by European bankers and industrialists.

In Latin America, the general attitude is that restrictive business practices and their correction are not matters of importance in comparison with other economic problems.

The British dominions are somewhat more alert, and the Canadian viewpoint closely approaches that of the United States.

Few of the European laws on the subject exhibit anything like the aggressiveness of our antitrust statutes. Many of them control practices which in a particular case are deemed contrary to the public interest, without any condemnation of cartel arrangements as such, and even the British law merely provides for investigation and remedial action when found justified in the public interest.

The European viewpoint is the result of centuries of development in which foreign trade was of first importance. Monopolies were granted by rulers or reserved to themselves far back in history.

Domestically, the guilds and similar organizations controlled production and trade in their industries.

Congress may be able to outlaw American participation in international cartels, but it looks as though the cartels themselves will still be there for some time to come.

cal equipment, Class "B" items of machinery and equipment, and process towers and vessels, if any; and on construction of the entire project.

Stiffer reporting requirements have had to be imposed on the natural-gas industry because of the steel strike, however, and companies have been instructed to send in one copy of all purchase orders covering line pipe for recently approved PAD-26 projects within 48 hours after the order has been accepted by the mill. Similar reports are required on all purchase orders for line pipe covering previous PAD-26 projects placed since the filing of Form PAD-73.

Products Exports Slip

WASHINGTON.—Exports of major petroleum products averaged 279,900 bbl. daily for the week ended June 27, according to data compiled by the Petroleum Administration for Defense.

The decrease of 11,000 bbl. daily from the revised figures for the preceding week resulted from lower exports of aviation gasoline, kerosine, and distillate fuels. Most of the decrease was in distillate.

Detailed figures on exports for the week, compared with the preceding week and with averages for 4 weeks ended June 27, are shown in the accompanying table in thousands of barrels daily.

	—Week ended—		Average
	June 27	June 20	4 weeks
Aviation gasoline	24.4	26.6	30.9
Motor gasoline	29.8	17.9	17.0
Kerosine	20.2	28.7	24.6
Distillate	110.6	127.4	117.1
Residual	94.9	90.3	81.6
Total	279.9	290.9	271.2

More Copper for Gas Firms

WASHINGTON.—Increased allocations of copper tubing for use by gas companies in replacing or repairing service lines will be provided by the Petroleum Administration for Defense this quarter.

Improvement in the copper situation has made this action possible, although there is not enough copper available to permit unrestricted installation of new service lines.

Gas companies needing a third-quarter allocation of copper tubing for MRO purposes were given until July 25 in which to send in to PAD their purchase orders in duplicate, a statement of inventory on hand, and a

detailed report of their use of copper tubing for each quarter in 1949 and 1950. PAD reviews the order and issues authorization for purchase if it approves the request.

Trade Negotiations Shifted

WASHINGTON. — Negotiations for a new reciprocal-trade agreement with Venezuela have been swtiched to Washington after 3 months of talks in Caracas.

The transfer of the discussions indicates that the two countries are close to agreement on the major issue involved, that of the import tax and conditions on foreign oil entering the United States.

The State Department, however, commented only that "agreement has been reached on much of the matter under discussion, and both governments are hopeful that the negotiations may be successfully concluded in due course."

Department officials refused to reveal the basis for an agreement on oil, but recent reports from Caracas were to the effect that the present quota system would be abandoned and a further cut made in the import tax to 5.25 cents per barrel on crude below 25° gravity, with a 10.5-cent tax on lighter crude, an arrangement which would take care of residual crude.

Such an arrangement would be in the nature of a compromise between Venezuela's request for elimination of the quota and a cut in tax to 5.25 cents across the board, and reported United States suggestions for a cut in tax or elimination of the quota but not both.

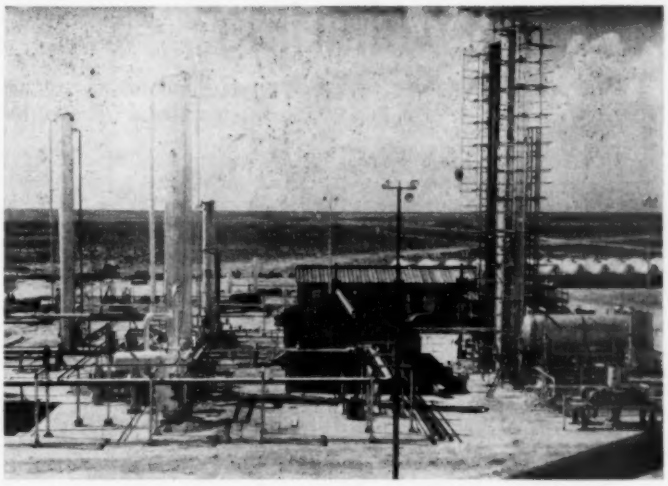
Under an agreement on procedure, the negotiations were to be held initially in Caracas, transferred to Washington when agreement was near, and wound up in Caracas where the agreement is to be signed.

Import Quota Nearly Full

WASHINGTON.—All but 5,000,000 bbl. of the 1952 quota of oil permitted to be imported at the reduced excise-tax rate by the Venezuelan reciprocal-trade agreement entered the United States before the end of June.

A Customs Bureau report of entries of commodities subject to quotas showed that on June 28 Venezuela still had 34,731,424 gal. unfilled in its 2,956,841,949-gal. quota.

The other two quotas—930,857,651 gal. for the Netherlands and 1,090,148,800 gal. for all other countries—already had been filled.



THIS PLANT was placed on stream less than 7 months after ground breaking.

New Conservation Twist

Wilshire-McElroy plant, on stream 16 months from date of field discovery, will prevent gas waste before it starts

Roy F. Carlson

MIDLAND. — Less than 16 months ago the first well began producing in Wilshire field in Upton County, West Texas. Less than 7 months ago there was no sign of a gasoline plant in the field. On July 19 the Wilshire-McElroy gasoline plant was dedicated formally.

This is noteworthy for two reasons: (1) Completion of a gasoline plant so early in the life of a field is highly extraordinary and (2) construction was pushed through unusually fast.

The first well in Wilshire field was completed on April 15, 1951; there are now 30 producing oil wells. Further development also will be rapid since 11 rigs currently are operating in the field. But the construction and operation of a gasoline plant this early in the life of the field is an unprecedented move in the field of gas and gas-liquids conservation.

The plant was built by Lone Star Producing Co. and will be operated by it for itself and Wilshire Oil Co., Inc.

Big gas savings . . . Conservationists estimate that there will have been saved about 12 billion cubic feet of gas along with the gas liquids in the next 2 years —when a plant probably would have been built under usual conditions after fuller development of the field. Initially, with 24 wells connected into the plant, it will process some 5,000,000 cu. ft. of gas per day and will produce about 17,000 gal. of liquid hydrocarbons per day.

Olin Culberson, chairman of the Texas Railroad Commission, and O. A. Hulcy, president of Lone Star Gas Co., both of whom addressed the dedication meeting, referred to the early building of the plant as a measure "not to stop waste of natural gas but to prevent such waste from ever starting."

Construction . . . Actual building of the plant took place rapidly because it isn't new. The plant was formerly in a field in Stephens County, Texas, and was moved to the Wilshire-McElroy location.

The dedicated plant is comprised mostly of equipment taken from the old plant. Engines, compressors, pumps, and other machinery were disassembled at the old location and moved and reassembled at the new one. As now assembled, the capacity of the plant is 16,000,000 cu. ft. of gas per day. However, by the addition of compressor capacity, this throughput can be doubled.

The plant was moved from its old location and erected at the new one at a cost of about $1,500,000.

Octanes Climbing

Du Pont sampling of gasoline from 47 cities shows regular averaging 83.5, premium 90.3; average use of TEL greater

OCTANE numbers of both premium and regular grades of gasoline were higher at the end of the second quarter than at the end of the first quarter or at midyear 1951, according to the latest quarterly survey of the petroleum-chemicals division of E. I. du Pont de Nemours & Co., Inc.

The unweighted average of premium-gasoline octane numbers for the 47 cities included in the survey was 90.3, compared with 89.9 on the April survey and 89.7 on the July survey last year.

Average TEL content for premium gasolines in the same cities was 2.22 cc. per gallon, the highest average since the survey for January 1951.

The average of octane numbers of regular gasolines in the 47 cities was 83.5 compared with 83.2 at the first of April.

While the gain in the average of octane numbers was slightly less for regular gasoline than for premium, the average use of TEL was greater. TEL content of regular gasoline was up .33 cc. per gallon compared with the increase of .28 cc. for premium.

Comparison of Motor-Gasoline Surveys

(Octane numbers are by research method; arithmetic averages by cities)

	Premium				Regular			
	Oct. No.			TEL content	Oct. No.			TEL content
	July 1951	April 1952	July 1952	cc./gal. July 1952	July 1951	April 1952	July 1952	cc./gal. July 1952
Aberdeen	89.1	89.0	88.9	2.01	81.7	81.5	81.4	1.29
Amarillo	88.0	88.8	88.8	1.77	80.0	81.4	81.1	2.04
Atlanta	91.2	91.8	91.9	2.06	84.5	84.6	84.7	2.36
Bakersfield	89.1	89.5	89.3	2.72	80.2	80.4	81.0	1.65
Baltimore	92.4	92.5	92.7	2.13	86.1	86.7	87.0	1.98
Boston	92.0	91.6	92.4	2.14	86.1	86.6	87.1	1.94
Calgary	84.4	86.1	87.0	2.68	78.9	80.0	81.6	2.12
Casper	88.2	88.3	89.0	2.03	81.0	81.9	81.7	1.46
Charlotte	91.8	91.7	92.0	2.24	84.9	85.0	84.9	2.23
Chicago	89.4	89.2	90.0	1.87	82.6	82.2	82.5	1.66
Cincinnati	90.9	90.7	91.5	2.48	84.6	86.0	86.3	2.43
Cleveland	90.6	90.6	91.6	2.44	85.8	86.4	87.1	1.98
Columbus	90.6	90.5	91.6	2.46	85.0	86.1	86.4	2.02
Corpus Christi	91.5	91.1	90.9	2.39	84.4	84.4	83.2	2.32
Dallas—Fort Worth	91.1	91.4	91.5	2.32	83.5	83.1	82.9	2.07
Denver	88.3	88.5	88.4	1.67	80.0	80.4	80.5	1.55
Detroit	90.8	90.5	91.5	2.41	84.7	85.9	85.9	1.73
El Paso	85.2	85.7	85.5	2.86	77.6	77.3	76.7	1.64
Great Falls—Billings	89.9	90.4	90.3	1.73	81.9	82.2	81.8	1.42
Houston	91.6	92.0	91.7	2.31	84.4	85.0	84.2	2.32
Indianapolis	89.6	89.9	89.8	2.71	82.4	83.0	83.6	2.16
Jacksonville	91.2	91.4	91.3	1.99	85.7	85.1	85.2	2.23
Kansas City	88.7	88.6	89.2	1.98	82.2	81.7	82.1	1.48
Little Rock	90.8	90.5	90.2	2.13	83.5	83.9	83.2	1.77
Los Angeles	89.7	89.7	90.5	2.26	81.1	81.7	82.0	1.76
Louisville	90.0	90.2	91.0	2.85	83.9	84.4	84.9	2.33
Memphis	90.2	90.9	90.9	2.26	83.4	83.3	83.7	2.04
Milwaukee	89.8	88.8	91.1	2.17	83.0	82.6	83.3	1.64
Minneapolis	88.8	88.8	89.3	2.26	81.7	82.2	82.2	1.76
Montreal	89.6	89.8	90.4	1.59	85.0	84.8	85.5	1.37
Nashville	89.7	90.4	90.6	2.29	83.4	83.9	84.1	1.85
New Orleans	90.2	91.2	90.6	2.41	83.4	84.1	84.5	1.90
New York (met. area)	91.8	92.0	92.4	2.22	86.2	86.7	86.5	2.00
Omaha	88.4	88.6	89.3	1.71	81.8	81.6	81.9	1.47
Philadelphia	92.0	91.5	92.1	2.20	85.8	86.3	87.0	2.26
Pittsburgh	91.5	91.5	91.7	2.38	85.7	86.4	86.6	2.40
St. Louis	88.8	88.7	89.7	2.24	81.9	82.2	82.8	1.85
Salt Lake City	87.9	89.2	88.6	1.81	79.4	79.6	79.3	1.30
San Francisco	90.1	90.3	90.9	2.39	80.9	81.4	81.9	1.32
Seattle	90.1	90.2	91.0	2.27	81.1	81.2	81.8	1.79
Shreveport	90.5	90.2	90.5	2.77	84.0	83.5	83.9	2.40
Spokane	89.5	90.0	90.4	1.56	82.0	81.8	82.0	1.33
Toronto	89.4	89.0	90.0	1.68	85.1	85.3	85.6	1.39
Tulsa	89.1	89.4	89.2	2.41	82.0	82.0	81.5	2.07
Vancouver	89.0	88.7	89.0	2.77	83.1	83.4	83.6	2.00
Wichita	87.8	87.0	88.0	2.38	81.1	80.7	81.8	1.65
Winnipeg	87.8	88.3	89.2	2.05	83.2	82.4	84.9	1.24

GENERAL COMPARISONS*

	July 1951	Apr. 1952	July 1952
Premium:			
Research octane No.	89.7	89.9	90.3
TEL content (cc. per gallon)	2.00	1.94	2.22
Regular:			
Research octane No.	83.0	83.2	83.5
TEL content (cc. per per gallon)	1.64	1.52	1.85

*Unweighted averages of 47 cities.

Increases expected . . . Increases in the use of TEL as well as higher octane numbers were to be expected on the July survey. Samples for the April survey were taken at service stations between March 27 and March 31. Since quantitative restriction on the use of TEL by refineries was not suspended by Petroleum Administration for Defense until the end of March, the April report did not show the effects of the suspension.

On the other hand, the very strong gasoline markets, caused by loss of gasoline production during the strike of refinery workers in May, placed the emphasis on volume rather than extra quality in the period after the strike.

Many distributors and jobbers who normally demand gasoline of above-average quality were having to accept some lower-specification product during most of June.

Arizona Refinery Proposed

DALLAS.—Construction of a refinery at Florence, Ariz., with initial capacity of 15,000 bbl. per day, including facilities for production of aviation gasoline, is proposed by Proven Oil & Refining Co.

This concern has been formed by the same interests backing West Coast Pipeline Co., which proposes to build a crude line from West Texas to Los Angeles. L. M. Glasco of Dallas is president of both firms. The Florence refinery would be supplied with crude by the new line, and its construction is contingent on completion of the pipe line.

The Petroleum Administration for Defense has recommended issuance of a certificate for accelerated tax amortization of 65 per cent of an estimated $17,973,000 for the proposed refinery. Florence is midway between Phoenix and Tucson, and the refinery would serve the most populous areas of the state. There are no refineries in Arizona at present, and petroleum products are supplied chiefly from the Los Angeles area.

Sulfur Shortage Licked

Petroleum-derived product played big part in balancing supply and demand in U.S.; Free World gap closing fast

NEW YORK.—The sulfur shortage in this country is virtually over, and the gap between supply and demand in the Free World as a whole is fast closing.

In a memorandum issued last week, Langbourne M. Williams, Jr., president of Freeport Sulphur Co., declared that construction of nearly 100 additional recovery projects here and abroad will boost Free World production by 4 million long tons annually by the end of 1955. This represents one-third of total current sulfur production outside the Russian sphere.

The 4-year survey of projected sulfur production reveals the significant role that petroleum-derived sulfur has played in bringing United States supply and demand into near-balance.

Elemental sulfur and acid recovered from natural gas and refinery gas still comprise a very small fraction of total domestic production. At the first of this year, total capacity for petroleum-derived sulfur amounted to 411,000 long tons per year. Estimated 1951 production from petroleum sources was about 4.5 per cent of domestic production totaling 6,180,000 long tons.

When the critical sulfur shortage loomed last year, refineries and natural-gasoline plants represented a ready source, and new recovery projects now are going in rapidly.

This year nearly 30 per cent of all new domestic capacity is based on petroleum sources. By the end of 1955 22 per cent of sulfur capacity built in this country since 1951 will be so based. By that time, roughly 750,000 tons per year will be recovered from petroleum, representing about 9 per cent of total United States production.

Operations abroad . . . In Free World operations, petroleum sulfur is expected to pass the million-ton-yearly rate before 1955. Sulfur projects in foreign petroleum installations generally have lagged behind domestic programs, but the potential supply is considered to be substantial.

An Oil and Gas Journal survey *(January 14, 1952, page 61)* listed a total of 16 domestic petroleum-sulfur plants and two foreign plants in existence at the first of this year. To this total, the Williams report lists for completion during 1952-55 an additional 38 projects. These include 13 domestic plants, 2 Canadian projects, and 1 Mexican unit which will be based on natural gas.

Of the 22 projects to recover sulfur or acid from refinery gas, 15 are located in the United States, 3 in England, and 1 each in Argentina, Mexico, Sweden, and Trinidad. New plants announced since the first of this year include a 35,000-ton per year sulfur plant to be built at Worland, Wyo., by General Petroleum Corp. and Imperial Sulphur & Acid Co.'s 21,000-ton Farmington, N. M., project—both based on natural gas.

Additional projects to be based on refinery gas include: Swedish Shale Oil Co.'s 14,000-ton plant at Kvarntorp, Sweden; Shell's 8,000-ton unit at Shellhaven, England; Trinidad Leaseholds, Ltd., facilities for 6,000 tons at Trinidad; and Stauffer Chemical Co.'s new Compton, Calif., project for 8,700 tons per year.

Since the Williams survey was compiled, Globe Oil & Refining Co. has been granted a certificate of necessity for a small plant at its Lemont, Ill., refinery.

The accompanying table illustrates the rapid construction of petroleum-sulfur facilities which played an important part in meeting the current shortage. Over the next 3 years the volume of such new plants will dwindle, and new capacity based on pyrites will become a greater factor in boosting sulfur recovery.

Most of the new production in this country will continue to come from Frasch sulfur to be mined along the Gulf Coast. But new alternate sources throughout the Free World will be needed, and hydrogen sulfide present in natural gas and refinery gas will continue to provide added production for the indefinite future.

New Sulfur-Production Capacity in 1,000 Long Tons per Year

	1952	1953	1954	1955	Total
United States—					
Frasch process	800.0	500.0	70.0		1,370.0
Other native deposits	18.0	43.0	10.0		71.0
Pyrites	6.0	28.0			34.0
Smelter gases	43.0	37.5	22.0		102.5
Natural gas	189.2	26.2		35.0	250.4
Refining gas	143.8	61.0			204.8
	1,200.0	695.7	102.0	35.0	2,032.7
Remainder of Free World—					
Frasch process		200.0			200.0
Other native deposits	73.0	137.0		50.0	260.0
Pyrites	99.0	123.0	66.0	807.0	1,095.0
Smelter gases	68.0	10.0	20.0		98.0
Natural gas	30.0				30.0
Refinery gas	26.0	30.0	14.0		70.0
Sulfate minerals	20.0	150.0	55.0	30.0	255.0
	316.0	650.0	155.0	887.0	2,008.0
Total Free World	**1,516.0**	**1,345.7**	**257.0**	**922.0**	**4,040.7**

New Carter Chief

John W. Brice replaces O. Schorp as president

TULSA.—John W. Brice, who has been with the Standard Oil Co. (N. J.) organization since 1926, has been elected president of Carter Oil Co., effective August 1. He will succeed O. C. Schorp, who is retiring from active duty with Carter.

JOHN W. BRICE

O. C. SCHORP

Brice began his career as a field geologist for Humble Oil & Refining Co. in Texas. In 1931 he went to Venezuela as a geologist for Creole Petroleum Corp. and 8 years later became assistant manager for the Venezuelan firm.

He was appointed a director and a vice president in charge of exploration for Carter in Tulsa in 1942 and was made executive vice president the following year. Two years later he went to New York to become assistant coordinator of production and later coordinator for the Jersey parent company. He was made a member of Standard's board of directors in 1949.

Upon becoming president, Brice will

resign as chairman of the board, a position he has held since rejoining Carter last year.

Schorp has worked for Jersey affiliates since 1920 and joined Carter in 1939. He has been president since March 1943. He plans to make his home in Florida but will be available to the company for special assignments.

Oil Considered Good Risk

CHICAGO. — The oil industry and closely related lines borrowed a little more than $325,000,000 from life-insurance companies and other long-term investing institutions in 1951, according to the annual survey of private placement financing made by E. V. Hale & Co.

This total does not include financing for natural-gas pipe lines.

Petroleum pipe lines accounted for $129,500,000 of the total.

Producers, refiners, and distributors obtained $96,723,000, including oil and gas production loans amounting to $51,431,000.

Tool and supply companies borrowed $35,300,000 during the year.

Purchases of tank cars were financed to the extent of $68,948,000.

Industry Briefs

LOS ANGELES.—Bankline Oil Co.'s acquisition of Norwalk Co. is expected to be consummated by August 1, subject to the approval of the California Corporation Commission. Bankline will exchange 21 of its capital shares for each of the 12,675 Norwalk capital shares outstanding. The merger will make Bankline a fully integrated oil company, officials of the firm say.

PHOENIX.—Voters in Arizona will decide next November on a proposal to establish a state severance tax of 1 per cent on gross proceeds from mineral production including oil and gas. As yet there is no oil production in the state, but some exploration is being carried on.

TULSA.—The American Association of Petroleum Geologists has called for bids for construction of a new national headquarters building here. John G. Bartram, vice president of the organization, said bids will be accepted until the first week of August. Construction, however, may be delayed unless they fall within a "definite" and unspecified amount earmarked by the association, Bartram said. It is hoped to have the new headquarters building completed in time for the International Petroleum Exposition next May. Site for the building was purchased last month from W. G. Skelly, president of Skelly Oil Co.

AUSTIN.—Operators in this vicinity think it possible that the Texas Railroad Commission may assume jurisdiction over seismic drilling as an outgrowth of a hearing here on complaints that salt water is polluting a stream in Runnels County, West Texas. During the hearing a land owner testified that shot holes are becoming a serious menace to agricultural irrigation over the state. He said he thinks the answer lies in additional legislation.

OMAHA. — Northern Natural Gas Co. has purchased 100,000 shares of common stock in Husky Oil Co., Cody, Wyo., for an average of $10.50 per share. This is about 4 or 5 per cent of the entire Husky issue. The purchase involves an agreement whereby Northern will have first call on natural-gas produced by both Husky and its Canadian subsidiary, Husky Oil & Refining, Ltd. Northern and Husky currently have an agreement calling for oil and gas exploration of about 78,000 acres in Alberta. The latter firm has producing wells in Wyoming, Texas, and New Mexico and holds leases in other states.

LETHBRIDGE, Alta. — Campaigning here for reelection in August, Alberta Premier E. C. Manning said last week that the province has proven and estimated reserves of natural gas sufficient to supply Alberta's demands for 75 years. Proven reserves are sufficient for 30 years. Gas exports, which he defended vigorously, are necessary, he said, to establish a petrochemical industry in Alberta.

TULSA.—The International Petroleum Exposition housing-bureau office for the big oil show here May 14-23, 1953, will be opened August 1 at 616 South Boston Avenue, Tulsa. Barton A. Myers, bureau committee chairman, said last week requests for hotel accommodations should be sent in as soon as needs can be ascertained. However, he said, no action will be taken to confirm hotel reservations until January 15, 1953. Listings of private rooms, homes, and apartments will begin in September, as soon as listings can be checked by the committee.

Headed for Spraberry . . .

Beside a pumping well, this Cities Service rig prepares to make test of the unpredictable Spraberry sand in Reagan County, Texas. The tight formation and peculiar vertical fractures of this oil-bearing sand cause wide variations in the producibility of individual wells. This has led to the waggish remark that the Spraberry is "the largest reservoir of unrecoverable oil in the world."

World Production Falls

Crude output in May suffers sharpest decline since the war; U.S. drop, due to strike, offsets gains elsewhere

Dahl M. Duff

THE greatest decline in world crude-oil production in any single month since the end of the war occurred in May as a result of the oil strike in the United States.

Estimated production in the United States during the month was 5,200,000 bbl. daily, down nearly 1,230,000 bbl. daily from the average of the preceding month. It was the lowest domestic production in any month since May 1950. The strike shut down about a third of the country's refining capacity, and field operations were cut back as pipe-line runs diminished.

Because of this wholesale drop in output in the United States, world production declined nearly 9 per cent. The May world-wide daily average was 11,315,600 bbl., against 12,403,800 bbl. in April. As far as world crude production was concerned, the strike had a temporary effect approximately double that of the loss last year of Iran's 650,000 bbl. daily output.

Foreign output up . . . Foreign production showed a gain during May, but it was slight when compared to the 19.1 per cent reduction in the United States. Foreign output, exclusive of Russia and other Communist areas, averaged 5,054,400 bbl. daily, up 2.4 per cent or 121,000 bbl. daily over the previous month.

This was a new record high for non-Communist foreign production and represented the first month in which foreign output has risen above the 5,000,000-bbl. daily mark. The total

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total foreign less Russia and E. Europe
June	2,335.5	2,172.4	4,877.8
July	2,374.5	1,835.5	4,578.0
August	2,388.0	1,789.7	4,555.3
September	2,396.3	1,741.7	4,517.6
October	2,395.6	1,810.6	4,585.6
November	2,383.7	1,940.4	4,709.5
December	2,404.9	1,846.3	4,633.1
January	2,432.3	1,832.8	4,653.5
February	2,438.8	1,860.1	4,692.0
March	2,437.8	1,996.5	4,813.8
April	2,459.6	2,090.8	4,933.2
May	2,529.3	2,142.2	5,054.4

WORLD CRUDE-OIL PRODUCTION
(In thousands of barrels daily)

Country—	May 1952	April 1952	May 1951
Western Hemisphere:			
Argentina	68.0	68.0	69.1
Bolivia	1.6	1.6	1.5
Brazil	1.8	1.8	2.2
Canada	173.7	120.0	143.5
Chile	2.2	2.2	2.3
Colombia	107.8	107.6	106.6
Cuba	0.1	0.1	0.4
Ecuador	7.8	7.8	7.3
Mexico	218.7	218.1	180.2
Peru	46.0	45.3	44.4
Trinidad	57.2	57.2	56.7
Venezuela	1,844.4	1,829.9	1,698.4
Total	2,529.3	2,459.6	2,312.6
Europe and North Africa:			
France	6.7	6.7	5.7
French Morocco	2.2	2.2	1.6
Germany	32.7	32.8	25.7
Italy	0.8	0.8	0.4
Netherlands	14.0	14.0	14.2
Egypt	44.5	44.5	44.9
United Kingdom	1.1	1.1	0.9
Total	102.0	102.1	93.4
Middle East:			
Bahrein	30.0	30.1	30.1
Iran	30.6	30.0	717.1
Iraq	402.1	302.2	173.1
Kuwait	778.0	783.0	491.4
Qatar	64.9	66.4	52.0
Saudi Arabia	836.2	878.7	739.8
Turkey	0.4	0.4	0.3
Total	2,142.2	2,090.8	2,203.8
Other Asia:			
British Borneo	106.0	106.0	101.1
Burma	2.2	2.2	2.0
India	5.0	5.0	5.0
Indonesia	154.0	154.0	143.7
Japan	5.9	5.9	6.8
New Guinea	4.8	4.6	4.8
Pakistan	3.0	3.0	3.0
Total	280.9	280.7	266.4
Total foreign less Russia and other Communist areas	5,054.4	4,933.2	4,876.2
United States	5,200.0	6,429.4	6,170.0
Total, non-Communist areas	10,254.4	11,362.6	11,046.2
Est. Russia and other Communist areas:			
Austria	45.0	45.0	42.0
Romania	90.0	90.0	89.0
Russia	900.0	880.0	800.0
Other Communist areas	26.2	26.2	24.3
Total	1,061.2	1,041.2	955.3
World total	11,315.6	12,403.8	12,001.5

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Completely current reports also are lacking for certain countries of Southeast Asia. Data for earlier months have been revised where necessary. Other Communist areas comprise Albania, China, Czechoslovakia, Hungary, Poland, and Yugoslavia.

was 3.7 per cent above that of May 1951, a month in which Iran produced more than 700,000 bbl. daily.

Canada, Iraq, gain . . . The increased foreign production was due mainly to stepped-up output in two countries—Canada and Iraq. In other important foreign producing countries, output either declined or showed only a slight increase.

Canadian production was hitting its stride in May. Field operations are held back during the winter when the Interprovincial line to the head of the Great Lakes reduces throughput due to the halt in lake shipping. May production in Canada was estimated at 173,700 bbl. daily.

This is a new record, higher than last summer's peak of slightly above 170,000 bbl. daily which was reached in August. Continued gains are anticipated in Canadian production during the summer. Purchasers' requests for Alberta crude in June totaled 182,260 bbl. daily.

Production in Iraq climbed above 400,000 bbl. daily during May, the first full month of operation of the 30 and 32-in. line from Kirkuk field to Banias, Syria.

The May total was an increase of nearly 100,000 bbl. daily over April and compares to about 160,000 bbl. daily which was the maximum output possible in the country up until a few months ago prior to the completion of the new Mediterranean line and the beginning of commercial operations at Zubair field in southern Iraq.

Of Iraq's May production, 341,200 bbl. daily, equivalent to 1,391,929 long tons for the month, came from Kirkuk field, and 51,400 bbl. daily, amounting to 214,723 tons, from Basra Petroleum's Zubair operation.

Middle East picture . . . The Middle East as a whole averaged 2,142,200 bbl. daily during May. This is the highest since June of last year when, with Iran in operation, the region had a production of 2,172,400 bbl. daily. The all-time record production in the Middle East was established in May of last year when the total amounted to 2,203,800 bbl. daily.

The gain in Iraq's output was balanced by decreases in the other two major producing countries of the region. Kuwait dropped back 5,000 bbl. daily, but this area is still yielding about 286,000 bbl. daily more than it was in May of last year. The larger decrease came in Saudi Arabia where production fell 42,500 bbl. daily to 836,200 bbl. daily.

Venezuela . . . Production in Venezuela made another small gain in May. The total rose 14,500 bbl. daily to set a new record for the country of 1,844,400 bbl. daily. For the first 5 months, production in Venezuela averaged 1,826,648 bbl. daily compared to the 1951 average of 1,704,600 bbl. daily.

VENEZUELAN PRODUCTION IN MAY BY COMPANIES

	May 1952
Creole	830,225
Shell	569,999
Mene Grande	271,490
Socony	60,232
Mercedes	25,256
Texas	18,792
Richmond	19,992
Atlantic	17,741
Sinclair	12,385
Phillips	9,370
Pantepec	7,984
B.C.O.	941

Little change elsewhere . . . Production showed little change in the other oil countries of the Western Hemisphere. Preliminary figures on Mexico's output showed a daily average in May of 218,700 bbl., while Colombian production, exclusive of condensate, was up only about 200 bbl. daily.

Crude output in western Germany in May amounted to 143,776 metric tons, equivalent to about 32,700 bbl. daily. Of the total 62,627 tons came from England, 3,272 tons from Weser-Ems, 66,962 tons from Hanover, 10,409 tons from Schleswig-Holstein-Hamburg, and 506 tons from Baden.

Iran Wins Court Victory

World Court declares it has no jurisdiction in dispute over nationalization; A.I.O.C. again to seek arbitration

THE International Court of Justice at The Hague has sidestepped the Iranian oil-nationalization case by ruling that it has no jurisdiction in the dispute.

The court held, 9 to 5, that the 1933 concession held by Anglo-Iranian Oil Co., Ltd., was nothing more than a contract between a government and a foreign corporation and thus outside the court's province.

The decision was the second victory within the week for the anti-British, pro-nationalization faction in Iran. Earlier, an effort of Iran's shah to replace Prime Minister Mossadegh failed when riots and bloodshed broke out over the country.

The Iranian case was submitted to the World Court about a year ago by the British Government which argued that Iran violated international law in abrogating the concession agreement. The court subsequently issued an injunction asking temporary restoration of the company's properties pending a final decision. The injunction was ignored by Iran.

The decision, A.I.O.C. officials said, does not invalidate the company's claim that the Iranian Government has acted illegally. "The decision means that the International Court, which can only adjudicate cases falling within the sphere in which its jurisdiction has been accepted by the nations concerned, has decided . . . that it has no jurisdiction in this case," the company said.

Arbitration sought . . . The company said it would now renew its request for the appointment of an arbitrator to determine the dispute. The concession agreement contained a clause for arbitration of all disputes, but the Iranian Government has refused to comply.

The company last year asked the president of the court, acting in an individual capacity, to appoint a sole arbitrator, but this request was deferred while the British Government's case was pending.

Anglo-Iranian reiterated its intention to take legal action against purchasers of the oil from the nationalized properties. "The company maintains its claims to be entitled to all crude oil and oil products derived from the areas covered by its concession agreement and will continue to take all such action as is necessary to protect its interests in this oil," the company said.

"The rule of law is essential to the proper operation of world trade in general, and of the oil industry in particular. Anglo-Iranian remains ready, as always, to try to reach a reasonable solution of its differences with the Persian Government. Any agreement that may be reached should be just and equitable to both sides, based on the realities of the world petroleum industry and thus of enduring value."

How the court voted . . . In the 9-5 decision, the justices from the United States and Canada were among the minority. The majority group included the Arab and Asian members as well as those from the Communist countries. In cases before the court, however, the justices vote as individuals and not as representatives of their governments. The court is an agency of the United Nations and is the world's highest tribunal in international law.

Ghavam Lasts 4 Days

Mossadegh back as premier of Iran after efforts by new chief to form a government bring on wide-spread rioting

IRAN came dangerously close to full-fledged revolution last week over an attempt to install a new government to replace that of Dr. Mohammed Mossadegh, the uncompromising advocate of oil nationalization.

Bloody riots broke out over the country after the king, Shah Reza Pahlevi, appointed Ahmad Ghavam as the new prime minister. Ghavam, a more moderate leader, said he would try to reach some settlement of the oil conflict that has kept the Iranian industry shut down for nearly a year.

Ghavam resigned after 4 days in office, and Dr. Mossadegh was immediately reappointed. He and his supporters obviously were more firmly entrenched than ever, and hopes for a settlement of the oil question again faded. In reappointing Dr. Mossadegh, the shah gave him control of the army, thus completing his grip on the country.

Ghavam was reported to have fled for his life. National Front deputies in the Parliament drafted a bill for the confiscation of the former prime minister's property, and frontier police were ordered to prevent him from leaving the country. The fate of Ghavam's brief regime will discourage any further attempts to unseat Dr. Mossadegh's government.

The events in Iran illustrated the feeling which exists in the country over the oil question. The rioting mobs which forced Ghavam out as prime minister were stirred up by ultra-nationalists and National Front leaders. They were joined by the Tudeh (Communist) party which set up a clamor against American imperialists and "Point Four spies."

Extreme powers asked . . . A week earlier, Dr. Mossadegh had asked for a 6-month grant of virtual dictatorial powers to deal with Iran's growing financial crisis. Oil revenue which formerly met about a third of the country's government expenses has been cut off for more than a year, and the government is near the end of its fiscal rope.

One of the methods by which Dr. Mossadegh reportedly planned to meet the financial difficulties was by major cuts in the country's military establishment. To this end, he proposed to the Shah that he become minister of war in his own cabinet.

There were increasing indications that Dr. Mossadegh's program for extra powers would meet considerable opposition in the Iranian Parliament, particularly the senate. The Army acts under direct orders of the Shah himself, and when the Shah took a negative attitude toward Dr. Mossadegh's plan to become war minister, the prime minister resigned.

The day after his appointment, the new prime minister, Ahmad Ghavam, issued a statement accusing the Mossadegh government of promoting hostility between Great Britain and Iran and of handling the oil negotiations with a lack of tact. He said one of the prime objectives of his government would be to seek a solution of the problem on the basis of fairness and logic.

Optimism temporary . . . Ghavam's remarks raised new optimism in London and Washington that the nationalization issue might be settled, possibly along the lines of the formula proposed by the World Bank earlier this year.

Ghavam's support in the parliament melted away after the disorders began. In Teheran, the president of the parliament attempted to go to the Shah to report on the situation but returned to the building with the windows of his car broken. The fighting started in the bazaar in Teheran when a large crowd demonstrating for Mossadegh was ordered to disperse. Two demonstrators were killed by gunfire from soldiers. The rioters then marched to parliament with the bodies.

Mob gets tough . . . Crowds milled in the streets shouting, "Death to traitors." Some 3,000 persons attempted to burn Ghavam's home but were scattered by the Army with three dead. When a mob attempted to storm the parliament grounds, National Front deputies called inside the building the colonel commanding the troops defending the area. The colonel was then attacked and beaten by the deputies.

Hundreds were arrested, and the death toll in Teheran alone was estimated at around 20, with more than 100 injured or wounded. The rioting spread to other parts of the country while a general strike brought all business in the capital to a standstill. In Abadan, where Anglo-Iranian's now idle 500,000 bbl. daily capacity refinery is located, electricity and other public services were cut off after a large throng demonstrated.

After the announcement that Ghavam was out, several thousand persons marched to Dr. Mossadegh's home. The former prime minister appeared weeping on a balcony and said: "I congratulate my nation. Your sacrifice today saved my country. I wish I had been killed instead of so many innocent persons." He then fainted and was carried indoors.

AUSTRALIA

Stanvac Lets Plant Contract

Standard - Vacuum Oil Co. has let contract for engineering and construction of its new 20,000-bbl. daily refinery to be built at Altona near Melbourne, Australia, to C. F. Braun & Co., Alhambra, Calif.

The refinery will be managed by a Stanvac subsidiary, Standard-Vacuum Refining Co., Pty., Ltd.

Braun officials and a group of engineers and process designers currently are working with Stanvac's refining-coordination representatives in order to get the engineering work under way promptly.

The new refinery will adjoin the present 1,600 - bbl. lube oil and asphalt plant, which up to now has been operated by Stanvac's marketing subsidiary, Vacuum Oil Co., Pty., Ltd. Facilities will include modern cat cracking equipment, a crude topping unit, reforming units, treating equipment, and a steam-generating plant.

LATIN AMERICA

Argentine Imports High

Fuel imports into Argentina during May were the highest on record, according to information from Buenos Aires. Fuel imports totaled 789,380 tons during the month, exceeding the previous high of 794,619 tons reported in July 1951.

Figures published in the Argentine capital show that fuel-oil imports, at 342,794 tons, set a new high. They compare with 195,050 tons in April and 171,245 tons in May 1951.

Crude-oil imports of 509,427 tons also were among the highest known and compare with 181,910 tons and 281,-661 tons, respectively, for April and May 1951.

PERSONALS

Lion President

T. M. Martin is versatile head of expanding firm

THE career of Trueman Million Martin, 56, has been as aggressive as the company he heads—Lion Oil Co., El Dorado, Ark.

Lion has just announced a new expansion move—that of consolidating its land, geological, and production departments into one division and dividing its operating area into four regions with headquarters in Denver, Midland, Tex., Wichita, and Shreveport.

Martin, Lion president since 1947, was graduated from Brown's College, and got his start as a stenographer for Crane Co., Chicago. Later he worked for Stromberg Motor Devices Co., and served in the Army from 1917 to 1918. For the next few years he was variously employed selling cars, oil and gas leases, electric clothes washers, and life insurance.

He joined Advanced Petroleum Corp. in Chicago in 1922 and later worked for Diamond Petroleum Co., Louisville, Ky., which became Mid-Continent Petroleum Corp. of Kentucky, a wholly-owned subsidiary of Tulsa Delaware Mid-Continent Petroleum Corp. (1923-29).

He joined Lion in 1929 and was elected a director and vice president. In 1939 he became executive vice president.

Martin is active in the Independent Petroleum Association of America, of which he is a director. He also is vice president, director and a member of the executive committee of Western Petroleum Refiners Association, and a member of the board of councilors of the American Petroleum Institute, the board of directors of Midwest Petroleum Markets Association, the Arkansas Petroleum Industry Committee, and the Arkansas Oil Information Committee.

John E. Howell, vice president of Lion Oil Co., El Dorado, Ark., will be general manager of the newly organized production and exploration division there. Functions of the land, geological, and production departments will be combined in the new division. **Frank Richardson** has been appointed assistant general manager, and the staff will include **E. D. Klinger,** chief geologist, and **F. E. Steele,** general superintendent of oil production. Regional managers of the division and their locations are: **C. L. McArthur,** Denver, Rocky Mountain region; **F. H. McGuigan,** Midland, southwestern region; **R. I. Williams,** Wichita, central region, and **Bert E. Gamble,** Shreveport, southern region. Howell, assisted by Richardson, will continue to direct the activities of the pipe-line and gas-gasoline departments.

Austin W. Strong has been appointed vice president of Southern California Gas Co., Los Angeles. He will be succeeded as supervisor of the general standards department by **R. B. Young,** department administrative assistant.

J. S. Harris, manager of the aviation department of Shell Oil Co. in New York, has been named chairman of the aviation advisory committee of the American Petroleum Industries Committee.

William Wallace Mein, Jr., is chairman of an executive committee appointed by the board of directors of Bishop Oil Co. at San Francisco to make recommendations for financing, organization and development of an expanded Canadian program by the company's new subsidiary, Canadian Bishop Oil, Ltd. Other committee members are **Louis J. Brunel** and **Charles W. Fay.**

H. J. Struth, petroleum consultant, has established an office in Dallas. During the last 2 years he has spent much of his time in South America as an economic consultant to the Venezuelan Government.

S. D. Favor, engineer for F. S. West Co., has been transferred from Houston to Los Angeles.

Harry A. Pearce has resigned as geologist for Republic Natural Gas Co. to open consulting offices in Oklahoma City.

Sam I. Hulse has been elected president of Midland Gasoline Corp., a jointly owned firm of Warren Petroleum Corp. of Tulsa and The Chicago Corp. of Corpus Christi. Hulse succeeds **James E. Allison,** who recently resigned as president and director to become president of Warren. Hulse already is a Warren vice president and a director of Midland. **Carl E. Wharton,** general superintendent of the manufacturing division for Warren, was elected to fill Allison's place on the Midland board of directors.

T. C. Nugent has been appointed to the newly created post of vice president and land-division manager for The California Co., New Orleans. Other staff appointments include: **N. H. Hickey,** chief evaluations geologist; **N. J. Smith,** research geologist; **H. T. Richardson,** chief geologist, and **H. O. Miller,** chief development geologist.

Carl E. Cloud, general superintendent for Oklahoma Natural Gas Co., has announced he plans to resign soon to become president of Midsouth Gas Co., Little Rock, Ark. He has been with Oklahoma Natural since 1934. He has served on the transmission committee of American Gas Association and is a member of the distribution management committee of the Southern Gas Association.

Ainslie Bell, formerly a geologist for The Texas Co., has joined the exploration staff of Oceanic Oil Co. in Billings, Mont.

M. R. Fairlie has been appointed director of lubricants research at Sinclair Research Laboratories, Inc., at Harvey, Ill.

L. L. Jones, formerly with Warren & Bradshaw Drilling Co., has organized General Drilling Co., with offices in Oklahoma City.

PERSONALS

R. W. Biggart has resigned from Foundation Oil Co. at Tulsa to become an independent consulting geologist there. He formerly was associated with **Lon B. Turk**, Oklahoma City consultant.

John A. Murphy, chief reservoir engineer for Continental Oil Co., has been transferred from Ponca City, Okla., to Houston.

D. B. Meisenheimer, reservoir engineer for The Texas Co. at Fort Worth, has been promoted to district petroleum engineer at Wichita Falls, Tex.

B. G. Rider, chief chemist for Malco Refineries, Inc., at Roswell, N. M., has been promoted to assistant superintendent at Prewitt, N. M.

Harry A. Trueblood, Jr., has opened consulting offices as a petroleum engineer and geologist at Sterling, Colo. He formerly was with McDermott & Barnhart and The California Co.

Lloyd Gray, formerly a geologist for Phillips Petroleum Co., has opened consulting offices in Englewood, Colo.

Robert B. Tenison, Midland, Tex., operator, has opened offices in Billings, Mont.

Harry W. Ross has resigned as assistant secretary and manager for Sohio Petroleum Co. in Canada, to open consulting offices in Calgary, Alta.

W. W. Wilson, engineer for Continental Oil Co. at Ponca City, Okla., has been promoted to assistant chief reservoir engineer. Other promotions in the reservoir-engineering section include **J. R. Spencer** and **W. A. Mead,** both promoted to supervising reservoir engineers.

R. B. LeFever, field superintendent for Stanolind Oil & Gas Co. in the Greggton area of East Texas, has been transferred to the North Cowden area in West Texas. He succeeds **J. O. Fair,** who has been appointed assistant district superintendent on the eastern Gulf Coast.

John Conway, product manager in charge of nitrogen, chlorine, and sulfur compounds for Carbide & Carbon Chemicals Co., has been appointed assistant manager to **Dr. R. L. Bateman,** manager of the company's fine-chemicals division. The firm is a division of Union Carbide & Carbon Corp., New York. Also appointed assistant managers were **J. A. Field,** formerly product manager for intermediates, and **W. A. Woodcock,** formerly product manager for plasticizers, solvents, and resin stabilizers.

Williston Information Tour

These men have just finished a tour of 17 North Dakota and Montana communities in the Williston basin, where they took part in panel discussions explaining the oil industry. Over 4,000 persons attended the public meetings. Left to right, the speakers are: C. F. Smith, assistant general superintendent of the Whiting refinery of Standard Oil Co. (Ind.); Gordon C. Locke, executive secretary and associate counsel, Committee for Pipe Line Companies; E. R. Shorey, Jr., mechanical engineer, Shell Oil Co.; Charles S. Agey, assistant chief geologist, Amerada Petroleum Corp.; C. W. Nelson, assistant economist, Federal Reserve Bank, Minneapolis, and T. N. Jordan, president, Illinois Southern Oil & Gas Co., moderator for the sessions.

Harold Reedy has joined the geological staff of British American Oil Producing Co. in Oklahoma City. He formerly was with Champlin Refining Co. in Enid, Okla.

Walter A. Smith, toolpusher for Failing Exploration & Drilling Co., has been transferred from Waco to Hillsboro, Tex.

E. B. Donnelly has resigned as a geologist for Carter Oil Co. to become a member of the geological staff of Amstutz & Yates, Inc., Wichita.

J. W. Smith has been named superintendent of the Glenrock, Wyo., refinery of Continental Oil Co. Smith, formerly assistant superintendent of Conoco's refinery at Denver, succeeds the late Paul L. Rawdon. **R. W. Broadhurst,** formerly resident engineer at Ponca City, Okla., has been named to succeed Smith at Denver.

Ted Braun, Superior Oil Co., Los Angeles, has been named vice president of the Pacific Section of the Society of Exploration Geophysicists. He succeeds **David Scott,** The Texas Co., who has been transferred to Houston.

Matthew Sandrod Tudor, who recently received his master's degree from the University of Wyoming, has joined Sun Oil Co. in Bismarck, N. D., as a geologist. He is a native of Wynona, Okla.

Hyler Lee has been appointed a geologist for Union Oil Co. in Bismarck, N. D. He formerly was with Gulf Oil Corp.

Verlin W. Koons, production engineer for Phillips Petroleum Co. at Odessa, Tex., has been transferred to Great Bend, Kans.

J. J. Haverfield, geologist for Continental Oil Co., has been transferred from Ely, Nev., to Vernal, Utah.

Nathan E. Tanner, Alberta minister of mines and minerals, will become president and managing director of Merrill Petroleums, Ltd., early in September. He will retire from public life

PERSONALS

following Alberta's August 5 election. Merrill Petroleums is being formed by the merger of three Alberta drilling concerns, Merrill Canadian Oil No. 1, Ltd., Cascade Drilling Co., Ltd., and Merrill Development Co., Ltd., all with head offices in Calgary.

Louis Walz has been appointed chief of the petroleum-refining section of the petroleum branch, Office of Price Stabilization in Washington, D. C. He replaces **Roger Williams,** who resigned earlier this year.

Col. Douglas R. Brown of the U. S. Air Force has been named executive officer of the Armed Services Petroleum Purchasing Agency. He succeeds **Capt. I. N. Tripi** of the Navy Supply Corps.

Lou Perry and Jack Raymond, geologists for Pure Oil Co., have been transferred from Terre Haute, Ind., to Olney, Ill.

Harry R. Dean has been elected assistant treasurer of Warren Petroleum Corp. at Tulsa. He formerly was secretary and treasurer of Devonian Co., a wholly owned Warren subsidiary prior to its liquidation June 30.

O. I. Jantz, seismograph party chief for Amerada Petroleum Corp., has been transferred from Cleveland, Tex., to McComb, Miss.

George H. Summers, party chief for Continental Oil Co., has been transferred from Gainesville to McKinney, Tex.

K. E. Tappy has been appointed superintendent of the Lima, Ohio, division of the pipe-line department of Ohio Oil Co., succeeding the late P. E. Thompson. Tappy has served as assistant division superintendent at Lima since 1940.

Dr. Oscar L. Wright and **Robert L. Carlyle** have joined the development and research department of Continental Oil Co., Ponca City, Okla. Dr. Wright will be a member of the organic laboratory staff and Carlyle will be engaged in research work on lubricating-oil additives. Since 1949 Dr. Wright has been head of the chemistry department at College of Emporia, Emporia, Kans. Carlyle recently received a master's degree in chemistry from Southern Methodist University, Dallas.

H. Safford Nye has been elected treasurer of Richfield Oil Corp., succeeding **M. Richard Gross,** who retired July 1. Nye is vice president of Security-First National Bank of Los Angeles.

J. Eddie Berryman, formerly assistant petroleum engineer for Atlantic Refining Co. at Dallas, has been appointed staff engineer in the special-projects group for Sohio Petroleum Co. at Oklahoma City.

Don C. Albers, district petroleum engineer for Ohio Oil Co. at Lovell, Wyo., has been transferred to Casper as production engineer.

L. E. Reilly, party chief for Donnally Seismograph Co., has been transferred from Odessa to McCamey, Tex.

Otis L. Branson has been appointed process superintendent of the Magnolia Petroleum Co. refinery at Beaumont, Tex., in the absence of **J. B. Godwin,** who is in Coryton, England, directing opening of a new lubricating-oil plant.

A. C. Elliott has resigned as western-division geologist for Shell Oil Co. at Midland, Tex., to manage a new office opened there by **Jake L. Hamon.** Elliott had been with Shell since 1937. Prior to that he was in the geophysical department of Magnolia Petroleum Co.

Charles W. Lane has been appointed head of the geological department of Seaboard Drilling Co. at Tulsa. For the past 5 years he has been with Deep Rock Oil Corp.

E. Oliver Jones, who recently resigned as special assistant to the director of refining division of the Petroleum Administration for Defense, has been named a consultant to the agency. Jones, who had been with the PAD since January 1951, returned to Ethyl Corp., New York.

DEATHS

P. E. Thompson, 65, superintendent of the Lima, Ohio, division of the pipeline department of Ohio Oil Co., died July 17 in Lima. He began his pipe-line career in 1906 with Prairie Oil & Gas Co. and worked for several other companies before joining Ohio in 1912.

Henry A. Lane, 70, retired civil engineer for Mid-Continent Petroleum Corp., died July 20 in Muskogee, Okla. He retired in 1950 after 34 years with the old Cosden Oil Co. and Mid-Continent.

Hoyt S. Gale, geologist, died recently in Los Angeles. He directed foreign geological explorations for Gulf Oil Corp. from 1921 to 1923 and surveyed oil possibilities in South Africa for Standard-Vacuum Oil Co. in 1938-39. For 17 years he was associated with the U. S. Geological Survey.

Lewis Y. Mattes, 70, petroleum engineer and former president of Estado Petroleum Corp., died recently in Los Angeles.

Clarence Jefferson Jasper, partner in J. I. M. Petroleum Co., died July 15 in a Long Beach, Calif., hospital.

William S. Duty, former president of Sterling Oil & Gas Co., died July 16 at his home in Winchester, Ky.

Floyd D. Blanton, 51, assistant superintendent of Pontiac Refining Corp., died following a heart attack in Corpus Christi recently.

Fred Nicholson, vice president and general manager of United Oil Co., Pittsburgh, died July 23. He formerly was associated with Elk Refining Co.

Everett M. Byers, 53, independent oil man, died at his home in Austin, Tex., July 20. He was widely known in New Mexico, where he was active in the development of Hobbs field and other fields in the southwestern part of the state. He moved to Austin in 1948 and maintained offices there and in San Antonio.

Dr. George L. Matheson, 52, chemical engineer for Standard Oil Development Co. in Linden, N. J., died July 19. He had worked for Standard since 1928.

I. D. Parmley, 65, assistant tax commissioner for Gulf Oil Corp. at Houston the last 27 years, died there recently.

Roy T. Osborn, 78, for 24 years counsel for Sinclair Refining Co., died July 18 in San Antonio. He worked in Chicago and New York and moved to Texas when he retired in 1942.

Highlights of First Half Year . . .

- **DRILLING FORECAST** for the last half is 22,598 wells to bring the year's total to 45,791, a new record despite steel shortage.
- **TOTAL FOOTAGE** for the year will reach 188,000,000 ft., a gain of 9 per cent over 1951 compared with 3 per cent for wells.
- **FIRST-HALF COMPLETIONS** totaled 23,193 for an increase of 12 per cent over first half of 1951 and a new all-time record.
- **CRUDE-OIL PRODUCTION** for the first half averaged 6,152,000 bbl. daily. The increase over first half of 1951 was held to 100,000 bbl. daily due to refinery shutdown in May.

MIDYEAR REPORT

AND

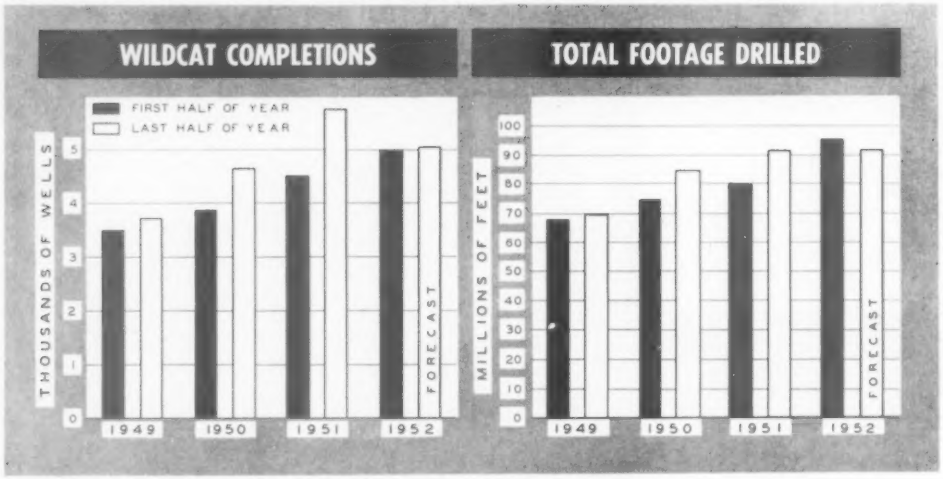
ENGINEERING REFERENCE

Section

- **DOMESTIC DEMAND** for all products will average 7,554,000 bbl. daily for last half, up 7.5 per cent from last half of 1951.
- **TOTAL GASOLINE DEMAND** will increase 5.7 per cent for the year. Domestic demand for distillates will be up 10.3 per cent.
- **REFINERY RUNS** will have to average at least 6,950,000 bbl. daily for last half to meet demands and build inventories.
- **L.P.G. PRODUCTION** averaged 266,600 bbl. daily in first half and accounted for 80 per cent of total increase in light products.
- **FOREIGN PRODUCTION** of crude averaged 5,933,200 bbl. daily for first 6 months, a gain of 6 per cent.
- **REFINERY EXPANSIONS** include 30 projects scheduled for completion this year and next. Survey shows 24 gas-processing plants, 12 under construction and 12 planned.
- **PIPE-LINE PROJECTS**, planned and under way, include 28,000 miles in this country and 8,700 miles in other countries.

. . . and the Engineering Reference Section

- **DRILLING** . . . Drilling and completion practices for shallow wells.
- **PRODUCTION** . . . New method for classification of oil and gas wells.
- **EXPLORATION** . . . Ample supply of undiscovered oil for nation's needs.
- **NATURAL GASOLINE** . . . L.P.G. underground storage looks promising.
- **PIPE LINE** . . . Analysis of pipe-line river crossings.
- **REFINING** . . . New type tray for distillation and absorption.



Record Drilling Year Seen, Despite Shortages

Drilling during last half year estimated at 22,598 wells, down from first half

by John C. Casper

OPERATORS are planning to drill enough wells in the last half of this year to bring to total for the year high enough to set an all-time record despite the shortage of material due to the steel strike.

This forecast is based on replies from hundreds of operators giving drilling programs as of the end of June. At the end of the first half, many felt that the steel strike would be over soon after the first of July. The forecast, based on these reported programs, has been adjusted for the extra loss due to the delay in settling the strike.

Since the major steel plants are still down at the time the forecast is being completed, some date must be selected for the ending of the strike as a basis for estimating the volume of material that will be available for drillers in the last half. Therefore, this projection is based on the assumption that the steel strike will be over by or soon after the first of August.

Total drilling in the last half is estimated at 22,598 wells for a decrease of 595 wells or 2.6 per cent from the total number completed in the first half.

Compared with the last half of 1951, drilling in the last 6 months of this year will be down 1,152 wells or 4.9 per cent. For the past 2 years, drilling in the last half has been about 14 per cent greater than in the first half.

Completions were so high in the first half and operations were so near rig and worker capacity that these factors would have limited increases in the last half to less than 14 per cent over the first half even if there had been no steel strike. A gain of 14 per cent over the first half would have put last-half completions up to almost 26,500 wells.

A comparison of the number of wildcat wells to be drilled in the last half with wildcat completions in

FORECAST FOR YEAR 1952
(First half actual plus last half forecast)

	Wildcat wells	Field wells	Total wells	Total footage (thou. ft.)
Alabama	33	40	73	409
Arkansas	75	290	365	1,366
California	596	1,964	2,560	10,740
Colorado	178	217	395	2,117
Dakotas	45	74	119	1,069
Illinois	576	1,304	1,880	4,517
Indiana	406	832	1,238	2,191
Kansas	880	3,911	4,791	16,318
Kentucky	265	1,112	1,377	2,741
Louisiana	370	1,959	2,329	15,881
North	168	1,072	1,240	4,700
South	202	887	1,089	11,181
Michigan	279	428	707	1,816
Mississippi	178	190	368	2,626
Montana	63	219	282	801
Nebraska	144	106	250	1,108
New Mexico	148	848	996	5,557
New York	2	766	768	987
Ohio	44	973	1,017	2,215
Oklahoma	797	5,162	5,959	22,577
Pennsylvania	18	1,825	1,843	3,554
Texas	4,675	12,382	17,057	83,647
Dist. 1 and 4	848	1,542	2,390	10,963
Dist. 2 and 3	692	1,934	2,626	16,990
Dist. 5 and 6	226	634	860	5,013
Dist. 7-B and 9	1,996	3,355	5,351	17,653
Dist. 7-C and 8	863	4,305	5,168	30,857
Dist. 10	50	612	662	2,171
Utah	39	21	60	375
West Virginia	15	586	601	1,791
Wyoming	152	498	650	3,387
Miscellaneous	90	16	106	300
Total United States	10,068	35,723	45,791	188,090

the first half and in the last half of 1951 shows a relative shift away from exploratory drilling in the first 6 months of this year and a partial return to an intensive wildcatting program in the last half.

One of the accompanying tables shows percentage of total drilling that has been exploratory since the beginning of 1949. The ratio of wildcats to total wells increased every period until the first half of this year. The ratio dropped from 24.30 per cent for the last half of 1951 to 21.52 for the first 6 months of this year. The wildcat portion of total drilling in the last half is expected to be 22.46 per cent.

The swing back to a higher percentage of wildcats is due to the steel shortage. Programs for the distribution of scarce and controlled materials have made it easier for operators to get material for wildcat drilling than for field wells. This allocation of materials for exploratory drilling will tend to increase the number of wildcats drilled and to cut development drilling.

The steel shortage may also shift some of the drilling from areas of deep drilling. An operator who knows that he can't get more than half the casing needed for the wells programed for a given quarter may choose to complete more wells in a shallower area and leave some of the deep drilling until materials are more readily available.

The average footage of wells forecast for the last half is 4,084 ft., compared with an average of 4,131 ft. for all wells completed in the first half.

The pipe shortage will cause major revisions in the drilling programs of the larger operators where lease commitments make it necessary to drill certain wells before the end of the year.

One of the most outstanding shifts in the last half program, as shown by operators' reports, was the large decrease in development drilling in West Texas.

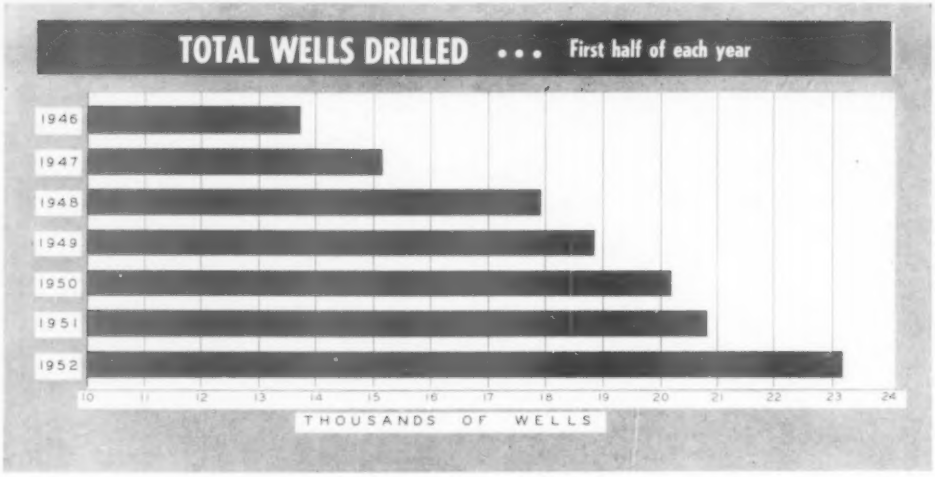
WILDCAT PERCENTAGE OF TOTAL DRILLING

	Wildcat wells	Total wells	Wildcat per cent of total
1949: First half	3,543	18,794	18.85
Last half	3,751	20,244	18.53
1950: First half	3,865	20,216	19.12
Last half	4,689	23,063	20.33
1951: First half	4,531	20,766	21.82
Last half	5,771	23,750	24.30
1952: First half	4,992	23,193	21.52
Last half*	5,076	22,598	22.46

*Forecast.

Drilling Forecast, Last Half, 1952

	Forecast last half 1952				Change from last half 1951			
	Wildcat wells	Field wells	Total wells	Total footage (thou. ft.)	Wildcat wells	Field wells	Total wells	Total footage (thou. ft.)
Alabama	15	32	47	264	+ 3	+ 24	+ 27	+ 147
Arkansas	35	135	170	629	− 20	− 54	− 74	− 251
California	308	1,020	1,328	5,558		+ 43	+ 43	+ 273
Colorado	85	92	177	920	− 5	+ 4	− 1	+ 20
Dakotas	34	58	92	833	+ 24	+ 58	+ 82	+ 784
Illinois	300	678	978	2,355	−221	−145	− 366	−1,017
Indiana	212	445	657	1,159	−136	− 37	− 173	− 344
Kansas	450	1,910	2,360	8,058	−118	+121	+ 3	+ 54
Kentucky	130	575	705	1,396	− 32	− 28	− 60	− 75
Louisiana	200	1,004	1,204	8,220	− 22	− 20	− 42	− 515
North	95	544	639	2,434	− 33	− 65	− 98	− 325
South	105	460	565	5,786	+ 11	+ 45	+ 56	+ 840
Michigan	142	220	362	928	− 24	− 1	− 25	− 24
Mississippi	93	94	187	1,337	− 20	− 19	− 39	− 161
Montana	39	128	167	463	+ 2	− 4	− 2	+ 28
Nebraska	69	55	124	548	− 12	+ 16	+ 4	− 36
New Mexico	72	422	494	2,784	+ 10	+ 34	+ 44	+ 536
New York	0	386	386	495		+ 53	+ 53	+ 14
Ohio	20	495	515	1,120	+ 4	− 40	− 36	− 48
Oklahoma	420	2,550	2,970	11,277	− 30	+ 86	+ 56	+ 730
Pennsylvania	9	920	929	1,690	+ 3	− 35	− 32	− 36
Texas	2,281	5,774	8,055	39,380	− 91	−376	− 467	− 811
Dists. 1 and 4	419	708	1,127	5,181	− 1	− 76	− 77	− 164
Dists. 2 and 3	339	949	1,288	8,327	+ 7	+103	+ 110	+ 923
Dists. 5 and 6	103	292	395	2,299	− 34	−138	− 172	− 614
Dists. 7-B and 9	952	1,605	2,557	8,436	− 57	+ 92	+ 35	+ 192
Dists. 7-C and 8	443	1,910	2,353	14,040	− 7	−302	− 309	− 984
Dist. 10	25	310	335	1,097	+ 1	− 55	− 54	− 164
Utah	20	10	30	186	+ 2	+ 3	+ 5	+ 28
West Virginia	9	285	294	875		− 46	− 46	− 82
Wyoming	92	226	318	1,661	+ 5	−100	− 95	− 451
Miscellaneous	41	8	49	146	− 17	+ 6	− 11	− 35
Total United States	5,076	17,522	22,598	92,282	−695	−457	−1,152	−242



First-Half Completions Establish New Record

Operators expected to maintain active exploratory program in all areas during last half

by John C. McCaslin

TOTAL wells completed and footage drilled during the first half of 1952 shattered all previous half-year records.

Operators completed 23,193 wells of all classes, an increase of 2,427, or 12 per cent. Only Illinois and Michigan reported fewer completions than last year.

Oil wells completed were up 1,242, or 11 per cent. Gas wells completed were up 175, or 13 per cent. Dry holes drilled were up 907, or 11 per cent. Footage drilled was up 20 per cent to a record total of over 95,000,000 ft.

A total of 11,689 field oil wells were completed to further boost the nation's supply of crude oil. Operators completed 768 wildcats for oil, 126 for gas. Over 22,000,000 ft. of exploratory wells was drilled during the first half as the unprecedented pace of exploratory drilling continued. Total wildcats drilled were up 9 per cent to 4,992.

Texas Still Tops

Texas kept its usual first place in number of wells completed with Oklahoma running in second place with a total of 2,989. Kansas, California, and Louisiana reported 2,431, 1,232, and 1,125 wells completed, respectively.

Completions in Texas totaled 9,002, up 11 per cent over the first half of last year. Footage drilled totaled 44,266,977 ft., up 21 per cent. Total wildcats drilled in Texas were up 358, or 17 per cent. Wildcat footage drilled was up 18 per cent. The trend toward deeper drilling continued in Texas with 39 holes taken below 12,500 ft. In Andrews County the deepest producing well in the Permian basin was completed in the Ellen-

COMPLETIONS BY STATES—DEPTH CLASSIFICATIONS

	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.
Alabama	5	4	14	2	1	0
Arkansas	30	133	17	13	2	0
California	401	454	231	76	59	11
Colorado	6	42	157	11	1	1
Florida	0	0	3	1	1	0
Illinois	406	496	0	0	0	0
Indiana	490	91	0	0	0	0
Kansas	281	2,100	47	3	0	0
Kentucky	434	238	0	0	0	0
Louisiana	257	185	156	197	254	76
North	251	178	110	49	13	0
South	6	7	46	148	241	76
Michigan	187	152	6	0	0	0
Mississippi	0	7	130	30	12	2
Montana	63	39	7	6	0	0
Nebraska	17	72	35	2	0	0
New Mexico	94	184	63	91	51	19
New York	380	2	0	0	0	0
North Dakota	0	0	2	16	3	2
Ohio	258	242	2	0	0	0
Oklahoma	839	1,444	520	126	56	4
Pennsylvania	775	105	33	1	0	0
South Dakota	1	2	0	1	0	0
Texas	1,850	3,021	2,677	1,168	247	39
North Central	1,025	1,316	451	2	0	0
West	263	622	1,370	435	98	27
Panhandle	54	248	14	10	1	0
East	22	172	149	112	9	1
Gulf Coast	113	320	355	437	104	9
Southwest	373	343	338	172	35	2
Utah	4	4	11	7	4	0
West Virginia	125	169	12	1	0	0
Wyoming	35	124	131	33	5	4
Miscellaneous	28	23	1	0	0	0
Total U. S.	6,966	9,333	4,255	1,785	696	158

burger at 13,884 ft. Total New Mexico completions were up 60 per cent with the Permian basin section of the state accounting for 359 of the total 502 wells completed.

Completions in Oklahoma were up about 10 per cent while the number of wildcats drilled was down by 88 wells. Kansas completions were up 15 per cent, but fewer wildcats were drilled than last year. Operators completed 1,232 wells in California, 931 of them for oil, increasing the crude output on the West Coast, which reached an all-time high of 988,000 bbl. daily in June. Louisiana chalked up a 13 per cent gain over last year in total wells completed.

Rockies at Record High

Drilling activity in the Rocky Mountain area increased to record highs during the first half.

Operators put down a total of 665 wells during the first half in the three-state area of Wyoming, Colorado, and Montana, breaking all previous records, for a gain of 25 per cent. Completions in Colorado were up 96 per cent. Exploratory drilling in Colorado is surging ahead at a fast pace with operators moving into little-explored areas of the Denver-Julesburg basin and into the southeastern portion of the state in their search.

Total completions in Wyoming were at last year's levels, but wildcat completions were up 30 per cent with 16 successful discoveries. Wildcatting was particularly heavy in northeastern Wyoming in the Powder River basin, the most active of Wyoming's basins in the past few years.

Exploratory operations are on the upgrade in the Montana portion of the Williston basin, particularly in the Cedar Creek and Poplar areas. Montana completions were up 23 per cent. Northwestern New Mexico recorded 127 gas wells as completions in that area increased to a record 143.

North Dakota reported 23 total completions during the first half, 17 of them successful oil wells. Footage drilled was 217,652 ft. In addition to Beaver Lodge field there are now two more producing areas in the state, Croff and Tioga.

Completions in Pennsylvania were up 20 per cent. In the Kane-Butler area a total of 177 wells was reported. The Bradford area recorded 565 completions, while the Leidy field area reported 61 new gas wells.

Completions in the Ohio-Michigan-Kentucky-Illinois-Indiana area were up by 86 wells over last year

Summary of Completed Wells, First 6 Months

	Total comp.	Oil	Gas	Dry	Service	Footage (thou. ft.)	Total Jan.-June 1951
Alabama	26	5	1	20	0	145	30
Arkansas	195	108	6	81	0	737	185
California	1,232	931	20	274	7	5,182	1,076
Colorado	218	94	15	109	0	1,197	111
Florida	5	0	0	5	0	34	0
Illinois	902	368	5	528	1	2,162	1,080
Indiana	581	217	7	357	0	1,032	539
Kansas	2,431	1,220	133	1,046	32	8,260	2,144
Kentucky	672	223	121	328	0	1,345	544
Louisiana	1,125	623	103	395	4	7,661	994
North	601	315	83	199	4	2,266	512
South	524	308	20	196	0	5,395	482
Michigan	345	135	13	171	26	888	359
Mississippi	181	59	3	119	0	1,289	149
Montana	115	61	5	49	0	338	93
Nebraska	126	39	3	84	0	560	121
New Mexico	502	276	134	92	0	2,773	323
New York	382	194	0	2	186	492	294
North Dakota	23	17	0	6	0	218	3
Ohio	502	189	106	168	39	1,095	420
Oklahoma	2,989	1,626	137	1,167	59	11,300	2,712
Pennsylvania	914	403	116	58	337	1,864	777
South Dakota	4	0	0	4	0	18	0
Texas	9,002	5,417	364	3,194	27	44,267	8,133
North Central (7-B & 9)	2,794	1,386	38	1,352	18	9,217	2,495
West (7-C & 8)	2,815	2,258	13	543	1	16,817	2,451
Panhandle (10)	327	154	115	56	2	1,074	340
East (5 & 6)	465	274	19	170	2	2,714	607
Gulf Coast (2 & 3)	1,338	727	109	501	1	8,663	1,135
Southwest (1 & 4)	1,263	618	70	572	3	5,782	1,105
Utah	30	8	0	22	0	189	14
West Virginia	307	35	233	39	0	916	282
Wyoming	332	208	7	117	0	1,726	332
Miscellaneous	52	1	16	35	0	120	51
January-June 1952	23,193	12,457	1,548	8,470	718	95,808	
January-June 1951	20,766	11,215	1,373	7,563	615	79,807	

WILDCAT COMPLETIONS, FIRST 6 MONTHS

	Comp.	Oil	Gas	Dry	Footage (thou. ft.)
Alabama	18	1	1	16	99
Arkansas	40	5	0	35	182
California	288	46	3	239	1,384
Colorado	93	13	6	74	535
Florida	5	0	0	5	34
Illinois	276	28	0	248	616
Indiana	194	17	2	175	366
Kansas	430	49	8	373	1,670
Kentucky	135	15	0	120	265
Louisiana	170	31	6	133	1,524
North	73	8	6	59	425
South	97	23	0	74	1,099
Michigan	137	11	4	122	307
Mississippi	85	10	1	74	626
Montana	24	2	0	22	113
Nebraska	75	3	0	72	294
New Mexico	76	24	1	51	516
New York	2	0	0	2	8
North Dakota	7	2	0	5	69
Ohio	24	0	7	17	89
Oklahoma	377	61	8	308	1,793
Pennsylvania	9	0	0	9	60
South Dakota	4	0	0	4	18
Texas	2,394	436	60	1,898	11,485
North Central	1,044	225	22	797	3,539
West	420	77	3	340	2,446
Panhandle	25	1	2	22	167
East	123	17	1	105	697
Gulf Coast	353	69	14	270	2,680
Southwest	429	47	18	364	1,956
Utah	19	0	0	19	110
West Virginia	6	0	3	3	33
Wyoming	60	13	3	44	324
Miscellaneous	44	1	13	30	111
Jan.-June 1952	4,992	768	126	4,098	22,631
Jan.-June 1951	4,531	700	118	3,713	18,891

DEVELOPMENT WELL COMPLETIONS, FIRST 6 MONTHS

	Comp.	Oil	Gas	Dry and service	Footage (thou. ft.)
Alabama	8	4	0	4	46
Arkansas	155	103	6	46	555
California	944	885	17	42	3,798
Colorado	125	81	9	35	662
Florida	0	0	0	0	0
Illinois	626	340	5	281	1,546
Indiana	387	200	5	182	667
Kansas	2,001	1,171	125	705	6,590
Kentucky	537	208	121	208	1,080
Louisiana	955	592	97	266	6,137
North	528	307	77	144	1,841
South	427	285	20	122	4,296
Michigan	208	124	9	75	581
Mississippi	96	49	2	45	663
Montana	91	59	5	27	225
Nebraska	51	36	3	12	266
New Mexico	426	252	133	41	2,257
New York	380	194	0	186	484
North Dakota	16	15	0	1	149
Ohio	478	189	99	190	1,006
Oklahoma	2,612	1,565	129	918	9,507
Pennsylvania	905	403	116	386	1,804
Texas	6,608	4,981	304	1,323	32,781
North Central	1,750	1,161	16	573	5,678
West	2,395	2,181	10	204	14,371
Panhandle	302	153	113	36	907
East	342	257	18	67	2,017
Gulf Coast	985	658	95	232	5,983
Southwest	834	571	52	211	3,825
Utah	11	8	0	3	79
West Virginia	301	35	230	36	884
Wyoming	272	195	4	73	1,401
Miscellaneous	8	0	3	5	9
Jan.-June 1952	18,201	11,689	1,422	5,090	73,177
Jan.-June 1951	16,235	10,515	1,255	4,465	60,916

despite losses in Michigan and Illinois. New York completions showed a gain of 30 per cent.

Oklahoma and Kansas experienced a successful program of rank wildcatting. Beaver, Major, Harper, and Beckham counties in Oklahoma and Meade County, Kansas, chalked up important new discoveries. Southern Oklahoma reported additional Springer sand discoveries during the first half. Beaver County is experiencing what may become the most active wildcat program in the state in many years.

Last-Half Preview

During the next half of 1952 operators are expected to continue the increasingly active exploratory program in all areas, particularly in the Williston basin area of the Dakotas and Montana.

A wildcat program may be expected for areas south and east of the Nesson anticline in North Dakota. With several important indicated discoveries in the Cedar Creek area, Montana seems assured of a record year in exploratory drilling.

SERVICE-WELL COMPLETIONS BY MONTHS

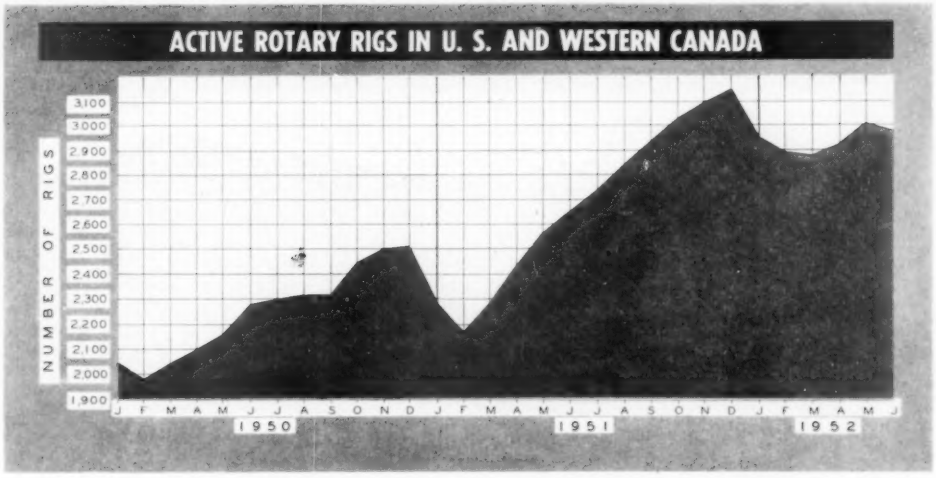
	Penn-sylvania	New York	Oklahoma	Other states	Total U. S.
January	49	24	10	16	99
February	49	30	11	17	107
March	55	34	18	21	128
April	49	38	5	27	119
May	61	28	8	30	127
June	74	32	7	25	138
Total	337	186	59	136	718

DISTILLATE-WELL COMPLETIONS BY MONTHS

	Texas	Louisi-ana	Oklahoma	Other states	Total U. S.
January	49	12	1	0	62
February	34	2	2	1	39
March	22	2	3	0	27
April	35	1	0	1	37
May	17	11	6	2	36
June	17	6	3	3	29
Total	174	34	15	7	230

WELL COMPLETIONS BY MONTHS

	Jan.	Feb.	Mar.	Apr.	May	June
Wildcat Completions						
Oil	124	117	152	123	145	107
Gas	21	21	20	25	19	20
Dry	803	608	593	697	713	684
Total	948	746	765	845	877	811
Development Completions						
Oil	2,034	1,811	1,944	1,939	2,051	1,910
Gas	259	228	239	212	262	222
Dry	870	735	839	835	973	838
Total	3,163	2,774	3,022	2,986	3,286	2,970
Total Completions						
Oil	2,158	1,928	2,097	2,062	2,195	2,017
Gas	280	249	259	237	281	242
Dry	1,673	1,343	1,432	1,532	1,686	1,522
Total	4,111	3,520	3,788	3,831	4,162	3,781
By Depth Classifications						
Depth (ft.)						
Under 2,500	1,169	1,099	1,127	1,157	1,253	1,161
2,500- 5,000	1,681	1,379	1,595	1,485	1,673	1,520
5,000- 7,500	797	672	660	745	719	662
7,500-10,000	298	240	274	315	353	305
10,000-12,500	141	108	107	97	132	111
Over 12,500	25	22	25	32	32	22



Steel Strike Results in Stacked Rigs

Year starts as a record breaker, but steel shortage forces sharp curtailment

by Neil Williams

EARLIER prospects that the number of rotary rigs operating in the United States and western Canada would climb during 1952 to new all-time record levels were being dimmed somewhat at midyear. Occasioned by the general strike in the steel industry which began early in June, the growing shortage of tubular goods, namely, casing and tubing needed for completion of wells, was beginning to be felt acutely at that time and forcing sharp curtailment of drilling programs in some areas. As a result, instead of the normally expected early summer expansion of drilling activity, rigs were being shut down and stacked in increasing numbers.

The year opened with a good start toward setting new all-time drilling records. The number of operating rigs which had just passed an all-time high a few weeks before—middle of December—was more than 630 greater than at the beginning of the previous year (1951). At the same time, the oil industry had before it a program calling for the drilling of a record number of wells during the year. This program, forecast at more than 45,000 wells as compared with the 1951 record of 44,500 wells completed, virtually would have assured operation of a relatively greater number of rigs throughout the year.

The normal seasonal decline in number of operating rigs was experienced during the early months of the year, cutting the number from the 1951 December peak and all-time high of 3,181 active rigs to a low of 2,839 rigs early in March. Since there was a comparable decline during the same period of 1951, the number of operating rigs during that period was maintained at the substantially high margin above the 1951 level.

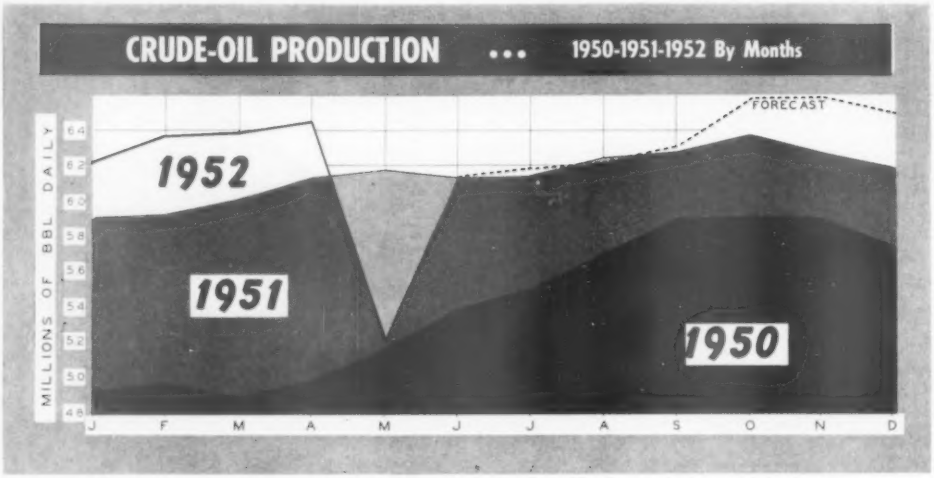
From the March low, the number of active rigs increased in a generally upward trend to a high mark of 3,032 rigs, reported during the middle of June, which was before the effects of the steel strike began to be felt seriously. That high, more than 400 rigs above the number operating at the same time the previous year, was only 149 rigs short of the all-time record of 3,181 rigs reached last December.

Curtailment of drilling since the middle of June had reduced the number of active rigs by July 1 to 2,850, or 182 rigs below the number running at that time, and only 137 more than the number running at the same time the previous year. By the middle of July another 150 rigs had been shut down, bringing the total down to 2,700 rigs, 48 below the number operating at the same time the previous year, and the smallest number reported at any time the latter part of June, that year.

DISTRIBUTION OF ACTIVE ROTARY RIGS
(Peak weeks by years)

	1952*		1951*		1950*	
Area—	Rigs	Per cent of total	Rigs	Per cent of total	Rigs	Per cent of total
Gulf Coast	603	19.9	667	21.0	603	23.9
N. & W. Tex.-N. M.	974	32.1	1,069	33.6	787	31.2
Ark.-N. La.-E. Tex.	161	5.3	195	6.1	163	6.5
Oklahoma	344	11.3	372	11.7	309	12.3
Kans.-S. Neb.	191	6.3	203	6.4	161	6.4
Illinois-Eastern	163	5.4	146	4.6	138	5.5
Rocky Mountains	229	7.6	190	6.0	114	4.5
Pacific Coast	169	5.6	179	5.6	132	5.2
Total U. S.	2,834	93.5	3,021	95.0	2,407	95.5
Western Canada	3,032	100.0	3,181	100.0	2,521	100.0
Total	3,032	100.0	3,181	100.0	2,521	100.0

*Peak weeks: 1952 (6 months), June 16; 1951, December 10; 1950, December 11.



Strikes Hold Production to a Modest Gain

Increase of only 100,000 bbl. daily recorded due to refinery shutdown in May

by Philip C. Ingalls

PRODUCTION of crude oil plus condensate produced on leases for the first 6 months of 1952 averaged 6,152,000 bbl. daily, nearly 100,000 bbl. daily more than for the first half of last year.

This substantial increase in production was made despite refinery and pipe-line strikes which cut May's average an estimated 1,229,000 bbl. daily below the April average. Had there been no strikes, production probably would have averaged nearly 6,400,000 bbl. daily during the first 6 months of this year.

Also despite the strikes which cut so deeply into May's production, 1952 appears headed for another record-breaking year of production. If forecasts of production during the next 6 months materialize, the year will average in the neighborhood of 112,000 bbl. daily, or about 1.8 per cent, higher than the all-time high set in 1951.

Final figures for production during the strike period, which extended throughout the month of May, are not yet available. Estimates from various sources put the total at about 5,200,000 bbl. daily for the monthly average. In this discussion that figure has been used for want of a better one.

Comparison With 1951

Production at the first of the year started off high—January's average daily production was 6,217,000 bbl., 310,000 bbl. higher than any previous January. Production during February climbed even higher, being 6,367,000 bbl. daily, or 437,000 bbl. daily higher than last year's record February. During March, daily average production climbed yet higher, reaching 6,388,000 bbl., but was only 336,000 bbl. daily higher than in March 1951.

During April 1952, daily average production exceeded 6,400,000 bbl. for the first time. The figure was 6,429,000 bbl. daily, 302,000 bbl. daily higher than any previous April.

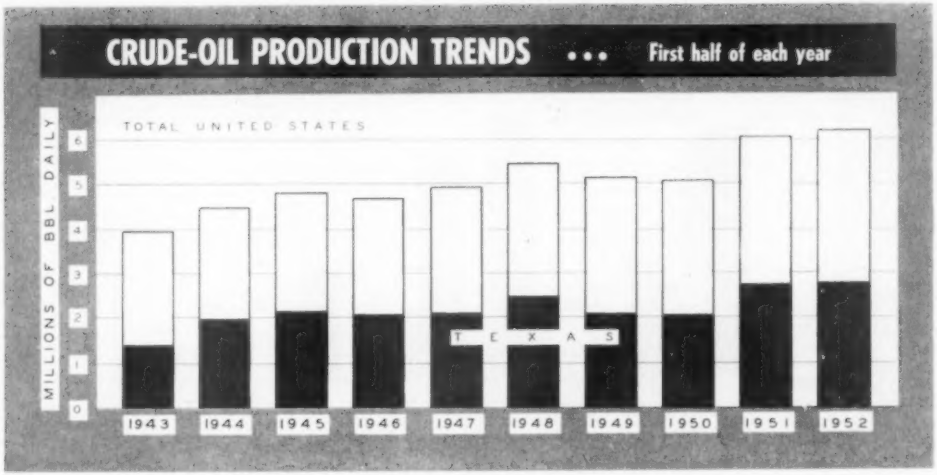
Effects of strike ... May was the strike month. Production dropped to about 5,200,000 bbl. daily, 830,000 bbl. daily less than for May 1951 and an estimated 1,229,000 bbl. daily less than for April of this year.

Kansas, Oklahoma, Texas, New Mexico, Colorado, and Wyoming were hardest hit by the strikes. Kansas, where strikes on pipe lines hampered transportation to storage, felt the greatest loss percentagewise. Here production was down from 334,000 bbl. daily in April to an estimated 130,000 bbl. daily in May.

Those states affected by refinery strikes, but whose pipe lines were not shut down, poured oil into storage. Crude stocks, which had been climbing since the latter part of March, took a sudden swing upward from about 265,000,000 bbl. at the end of April to 288,000,000 bbl. by the end of May. This stored crude, about 35,000,000 bbl. more than considered necessary for working stock, will have to be cut down before production can get into full swing. Stocks are expected to be back to normal by the fourth quarter. Once stocks have been reduced, production is expected to climb rapidly to nearly 6,600,000 bbl. daily. (See forecast line on chart.)

During June production averaged 6,136,000 bbl. daily. That was just 6,000 bbl. daily higher than in June 1951 in contrast to the big increases that each of the first 4 months of 1952 registered over the corresponding months of 1951.

During the first 6 months of 1952, Texas produced an average of about 2,750,000 bbl. daily. That is about



45 per cent of the total United States' production. As shown by the bar chart of production for the past 10 years, Texas has yielded almost half of the total production during that time.

West Texas (District 8 only) is currently producing more than 1,000,000 bbl. of oil daily to account for 40 per cent of the big state's total production. Most of this country's reserve producing capacity, variously estimated between 600,000 and 1,000,000 bbl., is in West Texas. About the middle of July it was announced that the Petroleum Administration for Defense had given full approval for the construction of a 24-in. (100,000 to 300,000 bbl. per day) crude pipe line from West Texas to California. The plan is to get a portion of the excess West Texas and New Mexico crude to the refineries of California which are now operating below capacity because they cannot get sufficient crude. Most of the crude released for this proposed line would probably be sour.

California, second largest producing state in the country, is running 20,000 bbl. daily higher than during the first 6 months of last year. The state's production, now at an all-time high, is more or less steadily approaching the 1,000,000-bbl.-daily mark.

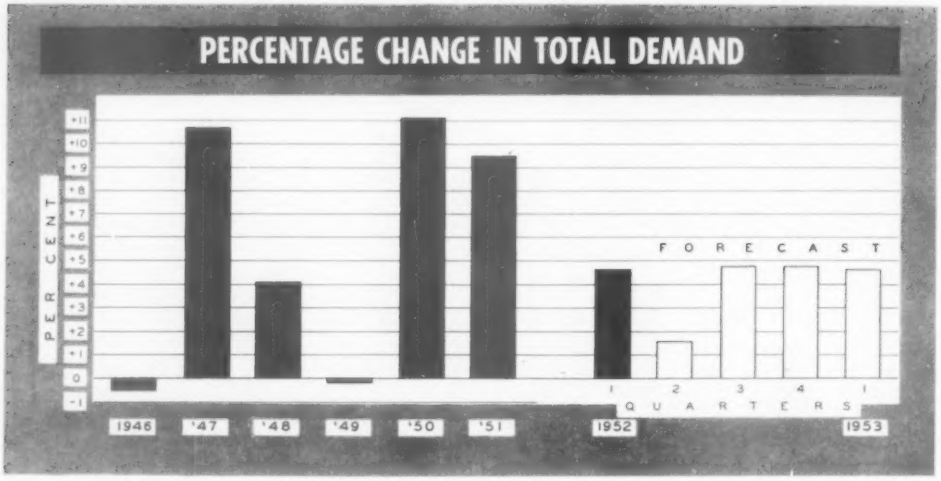
Louisiana, third largest producing state, was running 36,000 bbl. daily higher than last year.

With the steel strike threatening to curtail drilling in the months ahead, production may suffer also. Production depends on steel, not only for wells, but for transportation, storage, and refining. Each of these branches of the industry must keep pace if potential production increases are to materialize.

United States Crude-Oil Production—First Half Year

(Thousands of barrels daily)

	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943
Alabama	2.7	2.8	1.6	1.2	1.3	1.0	1.1	0.4	0.1	
Arkansas	81.8	81.6	85.8	84.8	85.7	80.2	77.0	80.1	80.1	73.6
California	984.4	964.5	866.6	938.2	940.2	903.6	854.8	916.0	829.9	772.3
Colorado	77.0	74.2	60.3	63.7	45.7	38.5	27.5	10.5	7.9	6.0
Florida	1.7	1.6	1.1	1.3	0.8	0.5	0.2	0.1	0.1	
Illinois	161.0	161.7	169.4	175.5	174.6	185.9	208.5	207.1	214.8	231.3
Indiana	31.3	26.6	28.9	24.3	17.2	17.1	18.7	13.1	14.1	14.9
Kansas	289.3	311.0	286.2	288.0	297.1	280.7	257.6	268.7	272.3	302.3
Kentucky	35.1	29.0	26.5	23.2	24.1	25.3	29.7	27.4	23.3	18.7
Louisiana	658.6	632.5	547.3	520.8	493.0	424.1	379.7	356.9	353.3	330.9
Michigan	37.4	39.3	44.7	44.6	44.9	42.8	47.2	48.2	51.9	58.4
Mississippi	99.5	102.4	101.0	108.5	120.2	88.4	57.8	51.1	42.1	54.9
Montana	25.1	24.3	21.8	25.8	24.8	23.2	24.8	23.3	23.8	20.6
Nebraska	5.8	7.5	2.3	0.6	0.6	0.6	0.9	0.9	1.1	2.1
New Mexico	160.4	141.4	126.6	132.9	128.1	105.6	99.1	104.3	111.5	101.1
New York	11.8	11.6	11.5	12.3	12.7	13.0	13.4	12.5	13.0	14.1
North Dakota	1.0									
Ohio	8.6	8.7	9.3	9.6	9.5	8.1	8.0	7.7	8.2	9.0
Oklahoma	504.1	506.7	417.8	419.1	411.3	375.7	375.1	376.7	333.5	341.7
Pennsylvania	31.0	31.8	31.8	32.1	34.9	34.6	35.6	34.7	40.1	44.7
Texas	2,752.4	2,695.2	2,034.8	2,106.8	2,427.0	2,146.0	2,055.3	2,161.8	1,950.4	1,429.1
Utah	3.9	3.7	3.2	0.8						
West Virginia	7.3	7.5	7.9	7.5	7.2	6.9	8.3	8.0	8.6	9.4
Wyoming	181.0	188.2	159.8	127.1	145.9	116.1	105.6	102.7	88.9	91.4
Miscellaneous	0.2	0.2	0.2	0.3	0.2	0.4	0.2	0.1	0.1	0.1
Total United States	6,152.4	6,054.0	5,046.4	5,149.0	5,436.4	4,918.3	4,686.1	4,812.3	4,469.1	3,926.4



Sights Lowered Slightly on '52 Demand

Lagging defense buildup and steel strike disrupt normal supply-demand patterns

by E. T. Knight*

PETROLEUM demands are expected to continue their upward trend through the next 9 months though the rate of increase will probably be somewhat slower than was anticipated at the beginning of the year. Forecast domestic requirements for the last two quarters of 1952, together with actual demands for the first quarter and estimates for the second, indicate a demand for the year of 7,407,600 bbl. daily, 5.3 per cent above last year, but 169,700 bbl. a day less than the 1952 demands forecast last January. Exports are expected to average 370,700 bbl. daily this year, a decline of 12.4 per cent from the 1951 rate.

Combined domestic and foreign demands, at 7,778,300 bbl. daily, show that the United States oil industry can expect to market 4.3 per cent more material than it did in 1951, but 2 per cent less than had been forecast previously.

Three factors were important in holding first-half petroleum demands below anticipated rates:

First, it became apparent early in the year that the national defense production program would not reach its peak as soon as had been expected, and with arms production being extended over a longer period the peak of industrial activity would not rise so high.

Second, strikes in the oil and steel industries disrupted normal supply-and-demand patterns. Even though the oil strike seems to have had little effect on rates of consumption of petroleum products other than aviation gasoline and refinery fuels, disruption of the orderly flow of products distorted demands on the petroleum industry. (Consumer demands which are met by depleting inventories at secondary storage points are not reflected in industry reports until stocks are replenished by shipments from refineries or bulk terminals.)

Closing of a substantial portion of the nation's steel-making capacity in the second quarter substantially curtailed the fuel requirements of that industry, the largest industrial consumer of residual fuel oil.

Third, heating-oil demand in the first half of this

*Acting economist, Atlantic Refining Co.

Forecasts . . .

TOTAL DOMESTIC DEMAND will average 7,554,000 bbl. daily for last half of 1952, up 7.5 per cent from same period last year.

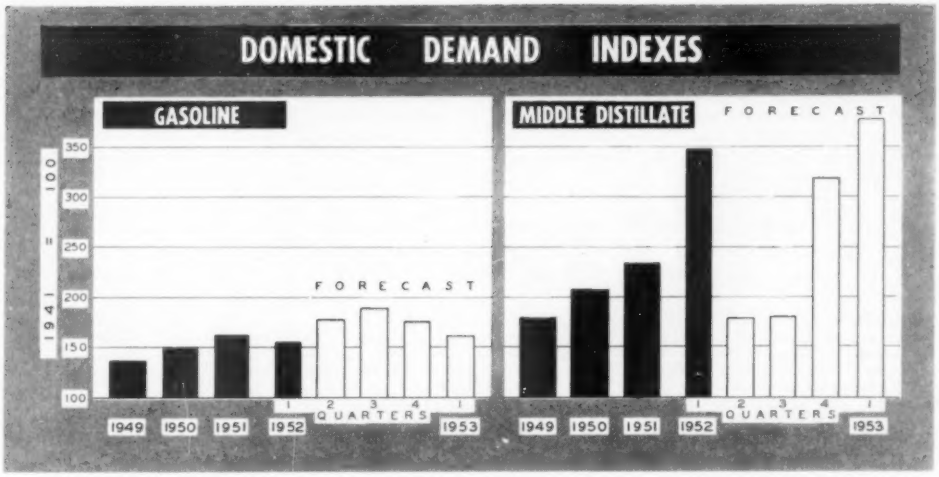
CRUDE PRODUCTION for last 6 months is forecast at 6,384,500 bbl. daily, up 2.2 per cent from 1951.

REFINERY RUNS are expected to average 6,979,000 bbl. daily for the last half.

EXPORTS in the last half will be down 33 per cent from last year.

DOMESTIC DEMAND for distillates will be up 10.3 per cent for the year.

TOTAL DEMAND for gasoline will increase 5.7 per cent for the year.



year was approximately equal to that which was forecast, but it would have been even greater had winter temperatures not been appreciably above normal in areas in which oil heating holds an important position.

At the time this is written the steel strike continues without indications of settlement. Nevertheless it has been assumed for forecasting purposes that a settlement will have been made early in July and that the mills will resume capacity operations shortly thereafter. Manufacturing industries dependent on steel supplies should then soon regain their stride. By the fourth quarter of this year United States industrial production, as measured by the Federal Reserve Board index, is expected to rise to 225 (1935-39 = 100), remaining at about that pace through the first quarter of 1953. Personal income, supported by a high rate of employment and rising wage rates, is expected to approach an annual rate of 275 billion dollars during the last half of 1952.

The current petroleum forecast is further predicted upon a maintenance of the status quo in Korea, Germany, and Iran, and upon the assumption that normal temperature will be experienced during the coming winter months.

TABLE 1—CRUDE-OIL RUNS TO STILLS IN UNITED STATES

	Barrels daily	Index	
1935-39 average	3,078,100	100.0	
1941	3,860,800	125.4	100.0
1948	5,595,600	181.8	144.9
1949	5,326,600	173.0	138.0
1950	5,739,400	186.5	148.7
1951	6,494,300	211.0	168.2
1952:			
First quarter	6,650,300	216.1	172.3
Second quarter*	6,047,000	196.5	156.6
Third quarter	6,918,000	224.7	179.2
Fourth quarter	7,040,000	228.7	182.3
1953:			
First quarter	7,100,000	230.7	183.9

*May and June estimated.

TABLE 2—DEMAND AND SUPPLY—1952-53

	First quarter 1953		Six months ending March 31, 1953	
Demand—	Forecast	% inc.‡	Forecast	% chg.§
Motor fuel	3,065,000	5.6	3,168,700	5.4
Domestic	3,000,000	6.6	3,098,600	7.1
Exports	65,000	—27.8	70,100	—37.7
Kerosine	520,000	2.8	512,400	4.0
Domestic	505,000	4.2	497,400	5.3
Exports	15,000	—29.0	15,000	—26.5
Distillate fuels	2,040,000	7.8	1,865,100	7.9
Domestic	1,990,000	8.5	1,817,600	9.1
Exports	50,000	—16.6	47,500	—24.4
Residual fuels	1,820,000	1.3	1,792,200	1.8
Domestic	1,760,000	2.2	1,729,700	2.9
Exports	60,000	—19.3	62,500	—21.2
Lubricants	152,000	0.3	153,500	— 2.4
Domestic	117,000	15.6	118,500	9.1
Exports	35,000	—30.6	35,000	—28.0
Wax	12,500	7.2	12,500	8.7
Domestic	9,500	9.4	9,200	9.5
Exports	3,000	0.7	3,300	6.5
Asphalts domestic*	100,000	4.5	127,800	1.6
Road oils domestic*	4,000	29.9	7,800	27.9
L.P.G. domestic*	350,000	10.4	344,900	9.8
Misc. and losses	333,500	3.8	331,000	4.2
Domestic†	315,000	5.6	312,500	5.8
Exports	18,500	—20.0	18,500	—17.5
Crude oil	85,000	—18.6	82,400	—18.3
Domestic and losses	25,000	10.7	22,400	—18.5
Exports	60,000	—26.7	60,000	—18.0
Total demand	8,482,000	4.7	8,398,300	4.7
Domestic	8,175,500	6.2	8,086,400	6.4
Exports	306,500	—24.1	311,900	—26.1
Supplies—				
Stock changes	—229,000		—203,400	
Crude oil	— 20,000		— 20,000	
Products	—209,000		—183,400	
Total new supply	8,253,000	4.7	8,194,900	5.3
Imports	1,025,000	8.4	992,100	13.6
Crude oil	600,000	20.9	584,800	27.2
Products	425,000	— 5.5	407,300	— 1.5
Domestic supply	7,228,000	4.2	7,202,800	4.3
Natural gasoline	635,000	3.5	627,500	3.3
Crude-oil production	6,593,000	4.3	6,575,300	4.4
Crude-oil runs to stills	7,100,000	6.8	7,069,700	7.0
Crude-oil transferred	28,000	0.6	28,000	3.7

*Exports included in miscellaneous exports. †Includes refinery losses. ‡Over 1952. §Over previous year.

Emphasis should be made at this point that due to suspension of industry reports during the oil strike, all second quarter 1952 data published in this article are the product of a considerable amount of "guesstimating." They are presented only as an indication of what the author believes may have occurred during that period. This gap in recent statistics has of course made more difficult the appraisal of short-term trends in supply and demand.

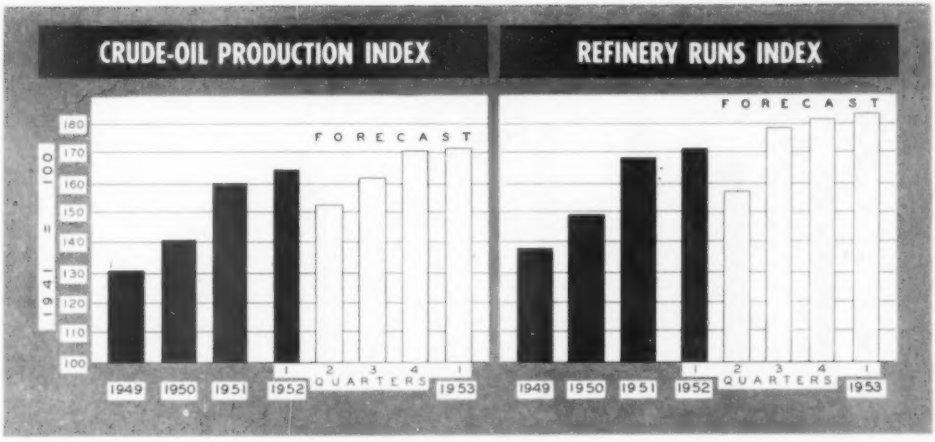
It should also be mentioned that major product stocks and domestic demand data employed in this forecast are on a revised basis to conform to the new definition of bulk terminals which has been adopted by both the Bureau of Mines and the American Petroleum Institute. Stocks are now being reported for an expanded number of terminal points, and as a consequence demand patterns are believed to follow more closely trends in actual consumption. A further

Table 3—Supply and Demand of Petroleum Products—1952

(Barrels daily)

	First quarter		Second quarter		Third quarter		Fourth quarter		Year-1952	
Demands—	Actual	Per cent inc. over 1951	Estimated	Per cent inc. over 1951	Forecast	Per cent inc. over 1951	Forecast	Per cent inc. over 1951	Forecast	Per cent inc. over 1951
Motor fuel	2,902,900	6.5	3,396,000	6.2	3,500,000	5.1	3,270,000	5.3	3,267,900	5.7
Domestic	2,812,870	5.7	3,319,000	6.9	3,420,000	7.6	3,195,000	7.5	3,187,400	6.9
Exports	90,030	41.1	77,000	—16.1	80,000	—46.6	75,000	—44.3	80,500	—27.2
Kerosine	505,680	6.2	238,000	3.4	252,000	5.0	505,000	5.1	375,200	5.3
Domestic	484,550	2.8	215,000	0.4	237,000	15.0	490,000	6.6	356,700	5.6
Exports	21,130	356.4	23,000	43.0	15,000	—55.8	15,000	—24.1	18,500	— 1.0
Distillate fuels	1,892,450	9.5	1,044,000	9.9	1,017,000	11.5	1,694,000	8.2	1,411,500	9.6
Domestic	1,832,470	8.0	961,000	7.6	967,000	18.3	1,649,000	9.9	1,352,100	10.3
Exports	59,980	97.0	83,000	46.3	50,000	—47.3	45,000	—31.4	59,400	— 4.4
Residual fuels	1,797,020	— 1.7	1,462,000	— 5.2	1,485,000	5.6	1,765,000	2.3	1,627,300	0.2
Domestic	1,722,680	— 3.7	1,377,000	— 5.9	1,420,000	9.9	1,700,000	3.6	1,555,000	0.7
Exports	74,340	93.6	85,000	6.3	65,000	—43.4	65,000	—22.9	72,300	— 9.2
Lubricants	151,510	— 3.6	152,000	—10.7	160,000	— 2.5	155,000	— 4.8	154,600	— 5.5
Domestic	101,170	—12.1	112,000	— 7.6	120,000	7.7	120,000	3.4	113,300	— 2.2
Exports	50,440	93.6	40,000	—18.3	40,000	—24.1	35,000	—25.3	41,300	—13.5
Wax	11,660	—17.5	12,000	—10.0	12,500	6.8	12,500	11.3	12,100	— 3.9
Domestic	8,680	—13.5	9,000	— 1.4	9,000	7.9	9,000	11.5	8,900	0.3
Exports	2,980	—27.1	3,000	—28.7	3,500	4.2	3,500	10.8	3,200	—13.5
Asphalts—domestic*	95,720	— 5.5	195,000	— 2.4	260,000	1.8	155,000	— 0.3	176,600	— 2.6
Road oils—domestic*	3,080	—34.7	17,000	— 4.0	35,500	1.2	11,500	27.5	16,800	0.6
L.P.G. (incl. L.R.G.) domestic*	317,140	5.3	275,000	6.0	280,000	7.3	340,000	9.4	303,100	7.0
Misc. products and losses	321,350	5.7	345,000	— 4.8	358,500	— 1.7	328,500	4.6	338,400	0.6
Domestic†	298,230	3.7	320,000	— 5.2	340,000	0.6	310,000	6.0	317,100	1.0
Exports	23,120	33.0	25,000	2.0	18,500	—30.8	18,500	—14.4	21,300	— 4.6
Crude oil	104,480	8.6	105,000	—10.5	90,000	—23.2	80,000	—17.6	94,800	— 6.5
Domestic—as such and losses	22,580	221.2	20,000	102.4	20,000	—52.8	20,000	—38.2	20,600	—10.4
Exports	81,900	— 8.1	85,000	— 0.2	70,000	— 6.4	60,000	— 7.2	74,200	— 5.3
Total demand for all oils	8,102,990	4.7	7,241,000	2.9	7,450,500	4.8	8,316,500	4.8	7,778,300	4.3
Domestic	7,699,070	3.4	6,820,000	2.9	7,108,500	8.4	7,999,500	6.7	7,407,600	5.3
Exports	403,920	39.7	421,000	3.1	342,000	—37.9	317,000	—28.1	370,700	—12.4
Supplies—										
Stock changes	—220,320		+163,000		+220,500		—178,500		— 3,700	
Crude oil	+ 36,740		+284,000		—272,000		— 20,000		+ 6,400	
Products	—257,060		—121,000		+492,500		—158,500		—10,100	
Total new supply	7,882,670	5.8	7,404,000	— 2.1	7,671,000	1.9	8,138,000	6.0	7,774,600	2.9
Imports	945,900	2.2	921,000	5.1	855,000	10.9	960,000	19.8	920,400	9.2
Crude oil	496,350	2.6	548,000	3.3	550,000	4.7	570,000	34.7	541,200	10.3
Products	449,550	1.7	373,000	7.9	305,000	24.2	390,000	3.1	379,200	7.6
Domestic supply	6,936,770	6.3	6,483,000	— 3.0	6,816,000	0.8	7,178,000	4.4	6,854,200	2.1
Natural gasoline and related products	613,760	8.9	570,000	5.2	605,000	10.4	620,000	3.1	602,200	6.8
Crude-oil production (domestic)	6,323,010	6.0	5,913,000	— 3.7	6,211,000	0.0	6,558,000	4.5	6,252,000	1.7
Crude-oil runs to stills	6,650,310	2.4	6,047,000	— 5.5	6,918,000	6.1	7,040,000	7.2	6,665,600	2.6
Crude oil transferred to products	27,830	21.6	25,000	15.0	25,000	— 5.1	28,000	6.8	26,400	8.7

*Exports of these products included in miscellaneous exports. †Includes refinery losses.



refinement of demand data will be possible if a suitable method can be developed for the measurement of inventories at secondary storage points. Such information would be an invaluable aid to the industry in appraising its task of providing adequate product supplies in periods of peak demands.

Demands for petroleum products for each quarter of 1952 are presented in Table 3, and for the 1952-53 winter months in Table 2.

Significant changes from the previous forecast of product demands for the last half of this year include reductions in anticipated demands for motor fuel and residual fuel averaging 36,000 and 55,000 bbl. daily, respectively. Lubricating-oil demands, which slumped badly in the first 6 months of this year, are expected to recover during the second half.

The petroleum industry in the months ahead must adjust its operations to compensate for the effects of the recent strike. Refinery production, as summarized in Table 1, is expected to rise to new record rates which will require near-capacity throughput in some areas. Some high-cost refining equipment may have to be returned to service. Product yields, as shown in Table 4, will have to be varied to maximize production of the products in seasonal demand for each period; summer gasoline requirements will be met largely from current output.

Anticipated stock levels are shown in Table 5. They are not recommended or desirable levels, but rather those which are likely to be realized in the light of forecast demands and probable rates of supply of products. They indicate, generally speaking, that gasoline supplies may be a little tight during the summer and fall; that heating-oil supplies should be adequate except as spot shortages may result from transportation difficulties; and that heavy fuel will be in adequate supply if the modest rate of imports forecast can be realized to supply the East Coast areas.

Crude-oil production during July and August is expected to fall below recent rates as current top-heavy inventories are corrected. Crude-oil inventory reductions are forecast at a rate of 272,000 bbl. a day during the third quarter to reduce stocks to about 260 million barrels. Further reductions during the winter may bring March 31 stocks down to about 256 million barrels. Production may increase some 350,000 bbl. daily to average 6,558,000 bbl. daily during the fourth quarter. A further slight increase is forecast for the first quarter of 1953. United States crude-oil production is expected to average 6,252,000 bbl. daily during the current year, an increase of 1.7 per cent over 1951.

In summary, it appears that through the coming winter the United States oil industry will once again be called upon to meet record high demands. These demands will be met in full, barring war or a severely cold winter, even though the industry may have to follow unusual and costly practices to deliver the desired volume of products to its customers.

TABLE 4—YIELDS OF PRODUCTS FROM CRUDE OIL RUN

	Motor fuel	Kerosine	Distillate	Residual
1951:				
Fourth quarter	43.20	5.88	20.80	19.50
1952:				
First quarter	42.41	5.91	21.95	19.71
Second quarter*	42.90	5.00	20.05	19.75
Third quarter	44.85	5.51	20.88	18.71
Fourth quarter	42.23	5.68	22.10	19.00
1953:				
First quarter	42.53	5.56	22.25	19.08

*May and June estimated.

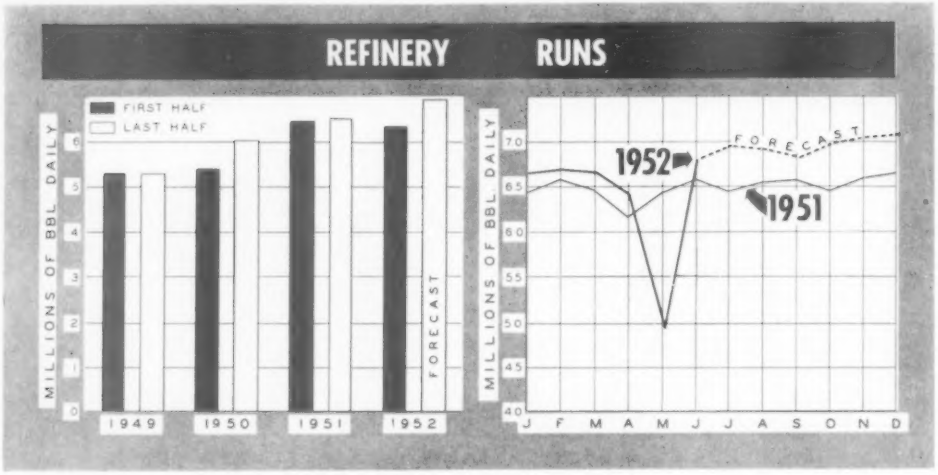
TABLE 5—STOCKS OF PETROLEUM PRODUCTS
(Thousands of barrels)

1952—	Finished motor fuel	Kerosine	Distillate	Residual fuel
January 1	127,120	27,088	86,619	42,853
March 31	152,556	16,817	48,750	37,971
June 30*	113,500	22,600	65,000	45,800
September 30	113,000	34,500	101,100	53,000
December 31	123,400	24,800	88,200	48,400
1953—				
March 31	153,500	13,500	48,600	43,300

*Estimated.

TABLE 6—U. S. PRODUCTION OF CRUDE OIL

	Barrels daily	Index
Winter 1950-51	5,901,300	100.0
Summer 1951	6,029,200	102.2
Winter 1951-52	6,299,600	106.7
Summer 1952	6,062,800	102.7
Winter 1952-53	6,575,300	111.4



Refiners Must Hustle to Make Up Strike Loss

Near-capacity operations will be required during second half to build up inventories

REFINERY runs will have to average at least 6,950,000 bbl. daily for the last half of this year to make up for the loss in product output during the refinery strike period in May.

Changes in product inventories during the strike period indicated a refinery production loss of about 50,000,000 bbl. This estimate was checked against calculated losses based on the capacities of struck plants and time loss due to strike.

Refinery runs for the first half of the year are estimated at 6,346,000 bbl. daily based on Bureau of Mines data for the first 4 months, the above estimates for May, and weekly reports of the American Petroleum Institute for June.

Runs for the January-June period represented a decrease of 99,000 bbl. daily or 1.5 per cent from the average for the first 6 months of 1951. First-quarter runs were 2.4 per cent greater than last year, but the second quarter dropped to 5.6 per cent under the same quarter in 1951.

Most of the decrease in the second quarter was a direct result of the refinery strike, but a few reductions were reported for refineries in the Mid-Continent and North Central areas in April. Lower runs in these areas were necessary to prevent the accumulation of excessive inventories, particularly gasoline.

Primary stocks of the four major products in District 2 were almost 15,000,000 bbl. or 22 per cent higher at the end of March than at the same time last year. By the end of April the surplus had been reduced until it was only 14.4 per cent over the end of April 1951.

The only important increases for the half year were in the Louisiana Gulf Coast and West Coast districts. These districts did not have any plants closed by strikes.

Settlement of the refinery strikes was followed closely by the steel strike. The closing of the steel mills and the reduction in operations by other heavy industries because of the steel shortage reduced the demand for residual fuel. By the first of July excess residual stocks were becoming a problem for Mid-Continent refiners.

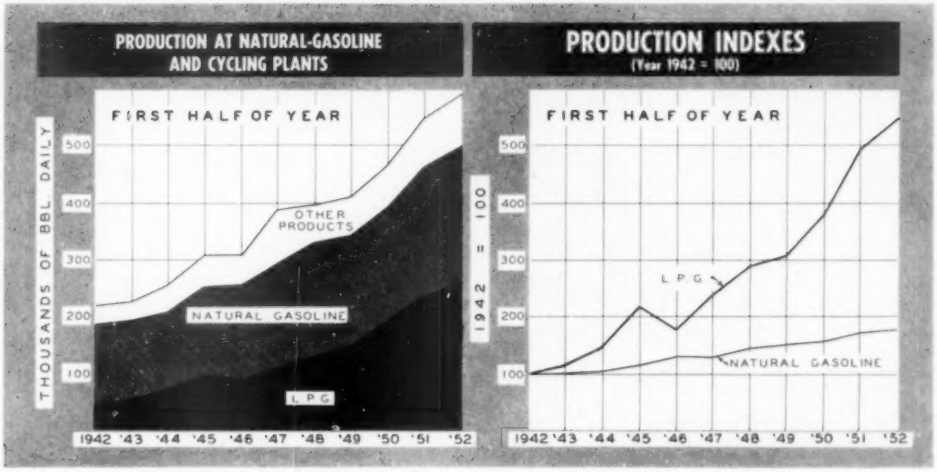
Refinery runs for June are estimated at about 6,790,000 bbl. daily. Since major product stocks gained 270,000 bbl. daily more in the 4-week period ended June 28 than in the same period last year, part of the June increase was used to replace some of the stock loss of the refinery strike period.

Primary stocks of gasoline, kerosine, and distillate were 22,000,000 bbl. under last year at the end of June, and the drop in primary stocks probably would have been even greater if secondary inventories on the East Coast had been maintained at normal levels. Near-capacity operations will be required for the last half.

REFINERY RUNS BY DISTRICTS—JANUARY-JUNE
(Thousands of barrels daily)

	*1952	1951	Change	Per cent change
East Coast	996	1,010	−14	− 1.4
Appalachian:				
District 1	106	103	+ 3	+ 2.9
District 2	71	76	− 5	− 6.6
Ill., Ind., Ky.	1,152	1,195	−43	− 3.6
Okla., Kans., Mo.	494	529	−35	− 6.6
Inland Texas	252	238	+14	+ 5.9
Texas Gulf Coast	1,482	1,552	−70	− 4.5
La. Gulf Coast	524	491	+33	+ 6.7
N. La. and Ark.	76	78	− 2	− 2.6
Rocky Mountain:				
New Mexico	18	14	+ 4	+28.6
Other Rocky Mountain	207	214	− 7	− 3.3
California	968	945	+23	+ 2.4
Total United States	6,346	6,445	−99	− 1.5

*Four months actual, 2 months estimated.



Light Hydrocarbons Set New Record

L.P.G. accounts for 80 per cent of total increase of 36,300 bbl. daily

by John C. Casper

PRODUCTION at natural-gasoline and cycling plants averaged 588,600 bbl. daily in the first 6 months of the year for a new record. Total production included 266,600 bbl. daily of liquefied petroleum gases, 232,500 bbl. daily of natural gasoline, and 89,500 bbl. daily of other products.

Although total production represented an all-time high, the gain over the first half of last year was less than for either of the past 2 years. The gain this year was 36,300 bbl. daily compared with increases of 78,800 bbl. daily in 1951 and 59,400 bbl. daily in 1950.

The smaller volumetric gain and the relative increase of only 6.6 per cent may indicate that the abnormal expansions in gas processing which have been features of the postwar period are to be followed by a period of growth with gains more nearly in line with those of crude oil. The average annual increase between 1942 and 1950 was about 10 per cent.

The largest part of the increase in production at natural-gasoline and cycling plants has been in L.P.G. Total half-year production at plants has increased 161 per cent since 1942, but plant production of L.P.G. has jumped 447 per cent. In the same period natural-gasoline output gained only 74 per cent.

L.P.G. accounted for 28,900 bbl. daily or about 80 per cent of the total increase of 36,300 bbl. daily for the first half. Natural gasoline gained only 2,400 bbl. daily.

An increasingly larger portion of L.P.G. demand is being supplied by plants. Actual production of liquefied gases at refineries was less for the first 4 months of this year than for the same period in 1951.

Reports from the field indicate that decreases in plant production near the end of the first half were more than would be expected from normal seasonal reductions. Shortages in steel resulted in general reductions in heavy industrial production for northern and eastern states. This cut industrial requirements for natural gas. With less natural gas to be processed, natural-gasoline and cycling plants produced less liquid products.

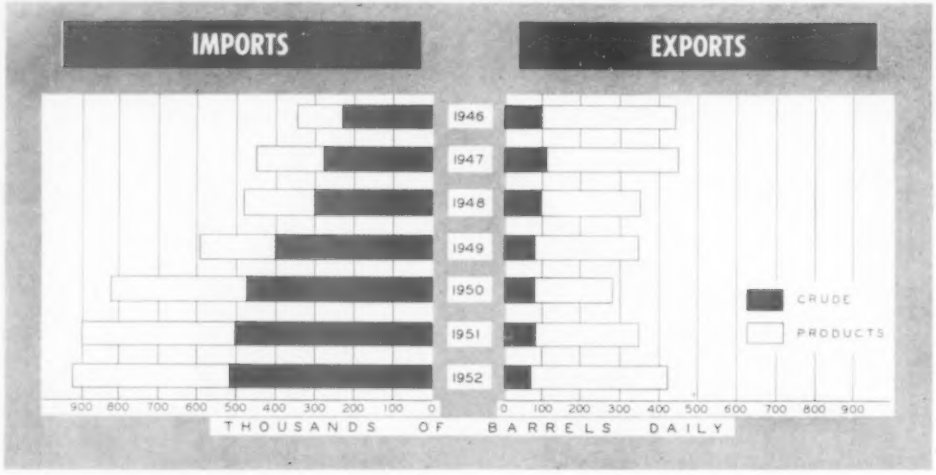
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION—JANUARY-JUNE
(Thousands of barrels daily)

	1952*	1951	Change	Per cent change
Texas	310.0	288.0	+22.0	+ 7.6
California	83.9	81.0	+ 2.9	+ 3.6
Louisiana	61.7	61.6	+ 0.1	+ 0.2
Oklahoma	49.9	46.4	+ 3.5	+ 7.5
Other states	83.1	75.3	+ 7.8	+10.4
Total	588.6	552.3	+36.3	+ 6.6

*Four months actual, two months estimated.

PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS—FIRST HALF OF YEAR
(Thousands of barrels daily)

	Natural gasoline	L.P.G.	Other	Total	Per cent change
1942	133.6	48.7	43.1	225.4	
1943	133.7	58.0	41.7	233.4	+ 3.5
1944	139.0	72.3	50.9	262.2	+12.3
1945	159.6	98.5	54.0	312.1	+19.0
1946	174.5	87.7	49.3	311.5	— 0.2
1947	174.0	117.9	56.5	384.4	+11.8
1948	189.4	141.1	62.1	392.6	+12.7
1949	190.8	150.7	72.6	414.1	+ 5.5
1950	205.4	186.5	81.6	473.5	+14.3
1951	230.1	237.7	84.5	552.3	+16.6
1952	232.5	266.6	89.5	588.6	+ 6.6



Both Imports and Exports Up First Half

Loss of Iranian crude had less effect on U.S. market than in last half of 1951

by Henry D. Ralph

BOTH imports and exports were greater in the first 6 months of 1952 than in the first half of 1951, but the volumetric gain for exports was more than twice the increase for imports.

Total imports for the first half of this year, based on actual data for the first 5 months and estimates for June, averaged 928,100 bbl. daily. Exports for the same period averaged 418,200 bbl. daily for a net import figure of 509,900 bbl. daily compared with net imports of 551,300 bbl. daily in the first half of 1951.

Crude imports for the 6-month period were up 6,100 bbl. daily while products gained 21,200 bbl. daily. About half of the total increase was in residual fuel.

Imports and exports in the first half were influenced less by the loss of Iranian crude and products in world markets than in the last half of 1951. Product exports from this country were about 29 per cent greater in the first half of 1952 than in the first half of 1951. Product exports in the last half of 1951 jumped 94 per cent over the last half of 1950.

Since increased refining capacity in other countries of the world is making it possible for these countries to supply a larger part of the world market that was formerly served from Abadan, product exports from the United States are expected to be less in the last half of this year than in the last 6 months of 1951.

On the other hand, total imports gained 3 per cent in the first half over the first half of 1951 compared with a loss of 11 per cent during the last 6 months of 1951. Since imports in the last half of 1951 were well below the level that would have been expected from the postwar trend, the percentage gain for imports in the last 6 months of 1952 may be greater than for domestic production of crude.

CRUDE IMPORTS BY COUNTRY OF ORIGIN*
FIRST 5 MONTHS
(Thousands of barrels daily)

	Jan.-May 1952	Jan.-May 1951	Change	Per cent change
Mexico	23.5	32.5	− 9.0	−27.7
Colombia	45.4	48.4	− 3.0	− 6.2
Venezuela	317.8	291.7	+26.1	+ 8.9
Kuwait	53.7	57.5	− 3.8	− 6.6
Saudi Arabia	54.2	52.9	+ 1.3	+ 2.5
Other Middle East	1.3		+ 1.3	
Borneo	8.4	8.4		
Canada	4.1		+ 4.1	
Total crude	508.4	491.4	+17.0	+ 3.5

*U. S. Department of Commerce.

IMPORTS INTO CONTINENTAL UNITED STATES

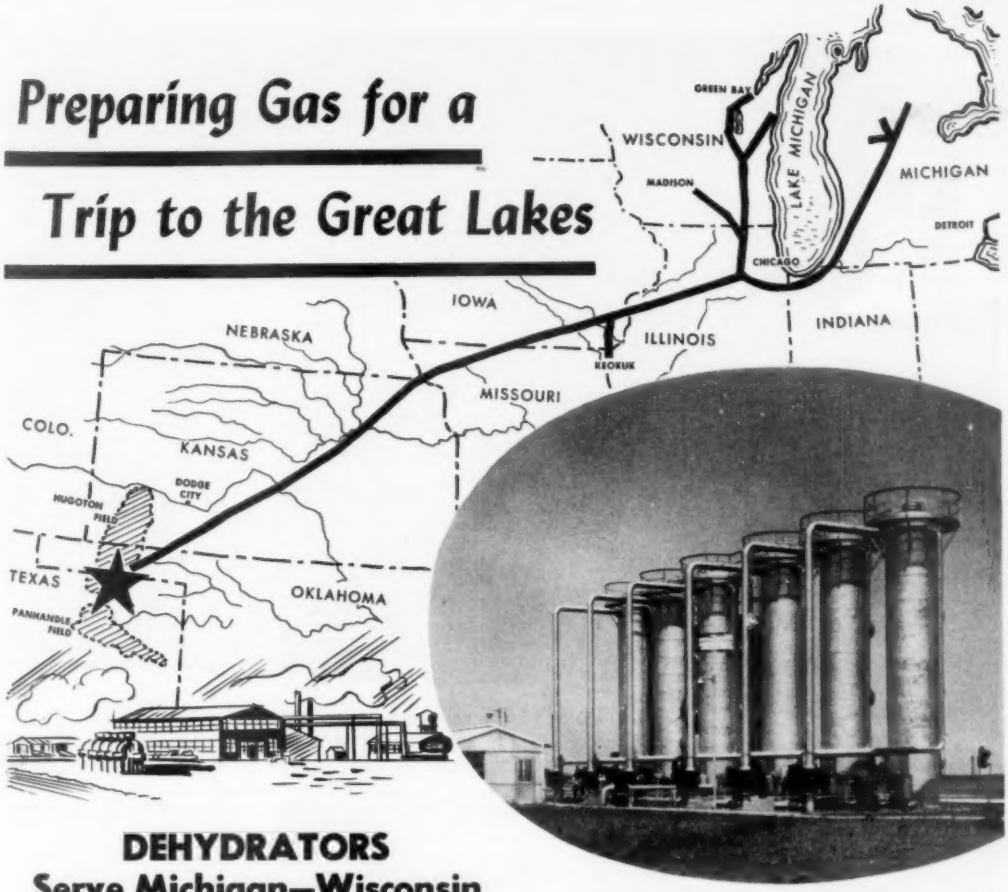
	Jan.-June 1952*	Jan.-June 1951	Change	Per cent change
Crude	513.3	507.2	+ 6.1	+ 1.2
Residual fuel	376.3	362.6	+13.7	+ 3.8
Other oils	38.5	31.0	+ 7.5	+24.2
Total	928.1	900.8	+27.3	+ 3.0

EXPORTS

	Jan.-June 1952*	Jan.-June 1951	Change	Per cent change
Crude	80.2	87.1	− 6.9	− 7.9
Gasoline	85.1	78.3	+ 6.8	+ 8.7
Kerosine	22.3	10.4	+11.9	+114.4
Distillate fuel	70.2	43.6	+26.6	+ 61.0
Residual fuel	81.9	59.3	+22.6	+ 38.1
Lube oils	47.6	44.4	+ 3.2	+ 7.2
Other oils	30.9	26.4	+ 4.5	+ 17.0
Total	418.2	349.5	+68.7	+ 19.7

*Five months actual, one month estimated.

Preparing Gas for a Trip to the Great Lakes



DEHYDRATORS Serve Michigan—Wisconsin Pipe Line Company's Plant in Hansford County

6 ft. diam. by 37 ft. 2 in. dehydrators built in accordance with design made by Ford, Bacon & Davis, Inc. for the Michigan-Wisconsin Pipe Line dehydration plant in Hansford County, Texas.

The Michigan-Wisconsin Pipe Line—extending from the Texas Panhandle to distribution points in the Lake Michigan area—originates at a field compressor station and dehydration plant in the Hugoton field, Hansford County, Texas. Gas gathered from nearby producing fields, and the adjacent gasoline stripping plant of Phillips Petroleum Company is prepared here for a long trip North.

The Hansford dehydration plant is a solid-adsorbent type, operating on a regenerative cycle. The dehydrators shown in the above view, four of which were built by the Chicago Bridge & Iron Company, operate at a pressure of 1000 lbs. per sq. in. to dry gas to a dew point below 0 deg. Fahr. Switching the towers from drying service to regeneration, and back to drying, is accomplished by motor-actuated valves controlled by an automatic panel.

Dehydrators are typical of the many types of steel plate structures we build to designs developed by petroleum engineers and the engineering departments of oil companies. In producing fields, along pipe lines, at refineries—these structures are helping increase production and storage efficiency. For more information about Horton structures, write our nearest office.

CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Atlanta, 3.....2154 Healey Bldg.
Birmingham, 1.....1536 North 50th St.
Boston, 10.....1025-201 Devonshire St.
Chicago, 4.....2128 McCormick Bldg.
Cleveland, 15.....2204 Guildhall Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Havana.....402 Abreu Bldg.
Houston, 2.....2119 C & I Life Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3.....1615-1700 Walnut Street Bldg.
San Francisco, 4.....1544—200 Bush St.
Seattle, 1.....1325 Henry Bldg.
Tulsa, 3.....1606 Hunt Bldg.
Washington 6, D. C.....1139 Cafritz Bldg.

REPRESENTATIVES AND LICENSEES

Horton Steel Works, Limited, Fort Erie, Ontario, Canada
Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Comprimo, N.V., 21, Amstel, Amsterdam (C) Netherlands
Compagnia Tecnica Industria Petroli, Rome, Italy
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Sociedade Chibridge de Construcoes Ltda., Av. Franklin Roosevelt, 194-S/704-C, Rio de Janeiro, Brazil

HEART BLOW

for a Cooling Tower

Report on FUNGI DETERIORATION

Results of field and laboratory research on fungi deterioration in cooling tower lumber have been compiled in a technical report, now available, without obligation, from Nalco. Report includes data on investigational findings, control and prevention methods, evaluation of results, and types of treatment. Ask your Nalco Representative for a copy, or write direct.

WHEN the ice pick plunges through a structural member as though it were paper, fungi deterioration has struck a heart blow at another cooling tower. Yet, if the infection has not brought about actual lumber collapse, there is a good chance Nalco can save the tower.

Basic Nalco 33 and 21-S treatment for recirculating cooling water systems prevents scale, corrosion, and delignification; effectively controls slime and algae. It will also *stop* fungi deterioration when chemical dosages are adjusted for this purpose.

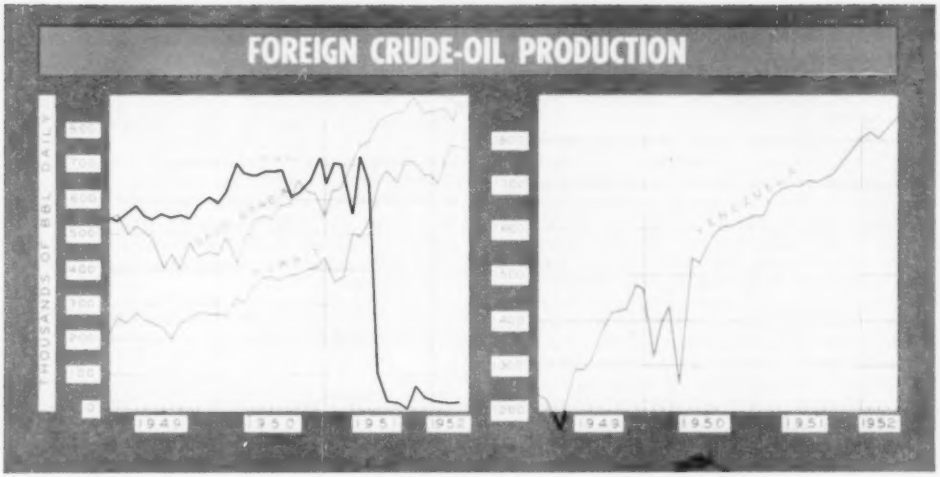
Preventing fungi infection is much simpler and safer than combatting it:

Nalco records indicate no cooling tower treated with Nalco 33 and 21-S has ever been attacked.

Act now to protect your cooling tower investment with the Nalco System.

NATIONAL ALUMINATE CORPORATION
6242 W. 66th Place • Chicago 38, Illinois
Canadian inquiries should be addressed to Alchem Limited, Burlington, Ontario, Canada

THE *Nalco* SYSTEM... Serving the Petroleum Industry through Practical Applied Science



Foreign Production Rise Slowed Slightly

Iranian loss is made up, however, and gain of 6 per cent recorded in first half

by Dahl M. Duff

FOREIGN production of crude oil continued to increase during the first half of 1952 but at a rate sharply below that of the last 4 years.

During the first 6 months, production in countries outside the United States rose 6 per cent as compared to the corresponding period of 1951. The average gain in first-half foreign production over the last 4 years has been 12.9 per cent.

The reason for the lower gain this year was the nationalization and shutdown of Anglo-Iranian Oil Co., Ltd., properties in Iran. The Iranian fields were in full production in the first half of 1951, and their output made up nearly 12 per cent of the foreign crude total. The estimated 30,000 bbl. daily produced by National Iranian Oil Co. the first 6 months of this year represents virtually all that can be withdrawn in the absence of export markets.

By the first half of this year, the industry had replaced Iranian crude and brought Middle East production back up to slightly above the level of the corresponding 1951 period when the Iranian fields were in operation. Together, Kuwait, Saudi Arabia, and Iraq increased their production in the first half of 1952 by a total of 613,000 bbl. daily over the first half of 1951, against a net loss in Iran of about 630,000 bbl. daily. Of the 613,000-bbl. daily gain, Kuwait provided 293,000 bbl. daily, or about 48 per cent. Saudi Arabia contributed 186,000 bbl. daily, and Iraq, 134,000 bbl. daily.

The disappearance of Iran as a major producing country caused the Middle East as a whole to show only a negligible increase in total output. Thus, practically all the 231,000-bbl.-daily total increase during the period was accounted for by countries outside the Middle East.

The outlook for the next 6 months is for an increase in Middle East production on the order of 300,000 bbl. daily. Most of this will be from Iraq. The longer-term outlook over the next few years indicates that, even without Iran, the Middle East will again show annual production gains comparable with those made prior to the Iranian shutdown.

Several significant developments occurred in foreign crude-oil production during the last 6 months. The most important was the completion of the new 30 and 32-in. pipe line by Iraq Petroleum Co., Ltd., on April 22. First crude was lifted from the new Banias, Syria, tanker terminal April 11 since the company was able to use existing line capacity from Kirkuk field to the bifurcation point in its system, and then the new line from the bifurcation point to Banias.

With the new large-diameter outlet, Kirkuk production began to climb. In January, with the line still under construction, Kirkuk was producing about 164,000 bbl. daily, the limit allowed by the existing 12 and 16-in. system. In April, the field's production moved up to about 257,000 bbl. daily, and in May to about 342,000 bbl. daily. By the end of the year, Kirkuk will be producing close to a half million barrels daily. The new line can handle more than 300,000 bbl. daily at full capacity when pumping facilities are completed. Another 160,000 bbl. daily capacity is available through the existing system.

Talk is heard in the industry of the possibility of a third large-diameter Persian Gulf-Mediterranean line. However, some observers believe its construction is

still 5 years or more away. Such a line presumably would deliver Zubair and Kuwait oil to the Mediterranean and give it a better competitive position. Another possibly more immediate project consists of the expansion of Tapline by the construction of additional stations.

A second significant event in foreign production was the commencement of commercial production from Minas field in central Sumatra by the Caltex organization early in May. The field is a major oil reservoir with reserves reported to be upwards to a half a billion barrels, and Caltex has two other field discoveries in the concession area. Shipments began at a rate of about 15,000 bbl. daily, and were to be built up to about 30,000 bbl. daily later in the year. Major increases in production from this area can be looked for, provided political and legal developments in the new Indonesian republic do not interfere. Standard Oil Co. of California is moving Minas oil to the United States at a rate of about 10,000 bbl. daily to help meet the deficit of light crude on the West Coast.

Canadian crude production showed a gain of nearly 29 per cent during the first half of the year. Output from the western Canadian fields was expected to rise to a maximum of about 200,000 bbl. daily late this summer and thus meet about half of Canada's domestic requirements. Western Canada's only outlet at present to world markets is through Interprovincial line to the Great Lakes, and this movement falls off in the winter with the closing of shipping on the lakes. The new line to be completed next year to the West Coast will allow another sharp increase in Canadian production, aside from that already resulting from the rapidly mounting demand in the prairie provinces themselves.

Mexico Shows Small Gains

Production in Mexico showed a relatively small increase in the first half of the year. This slight gain is believed due to the fact that Poza Rica field, which has been making up something over half of total Mexican production, has been cut back and a pressure-maintenance program instituted to avoid excessive withdrawals.

Small but steady gains continue to characterize the production trend in Venezuela. From January to May, Venezuelan output rose from 1,811,700 to 1,844,400 bbl. daily, dropping back only in March. Each increase represented a new all-time high in the country's total. However, more and more drilling is being required in Venezuela to maintain production from existing fields, and the country is now producing at virtually the limit of existing facilities. The government may grant new concessions, possibly next year, and this would result in stepped-up exploration which ultimately would be reflected in production.

From an exploratory standpoint, Peru seems likely to become the hottest new area in the Western Hemisphere. With the new law finally approved, a half a dozen major companies are showing an interest in initiating operations. If this work materializes and is successful, Peruvian poduction can be expected to rise in the next few years.

Aside from the new I.P.C. Banias pipe line, other work is under way or planned in the Persian Gulf to add to producing capacity of this important region. Iraq Petroleum is reported planning a second line across Qatar from the field to the tanker terminal. In southern Iraq. the same organization has announced preparations to lay a second line from Zubair field to the Fao terminal.

In the Far East, production from British Borneo by the Royal Dutch-Shell organization has apparently been stabilized at slightly above 100,000 bbl. daily. The company is continuing exploratory work in the area in an effort to enlarge its reserves. Western New Guinea's production rate has been stabilized at about 4,800 bbl. daily, but there are two other fields in this area which are to be brought on production. Wildcatting continues in Australian New Guinea, and Caltex is preparing to drill on Northwest Cape in western Australia itself.

FOREIGN CRUDE-OIL PRODUCTION

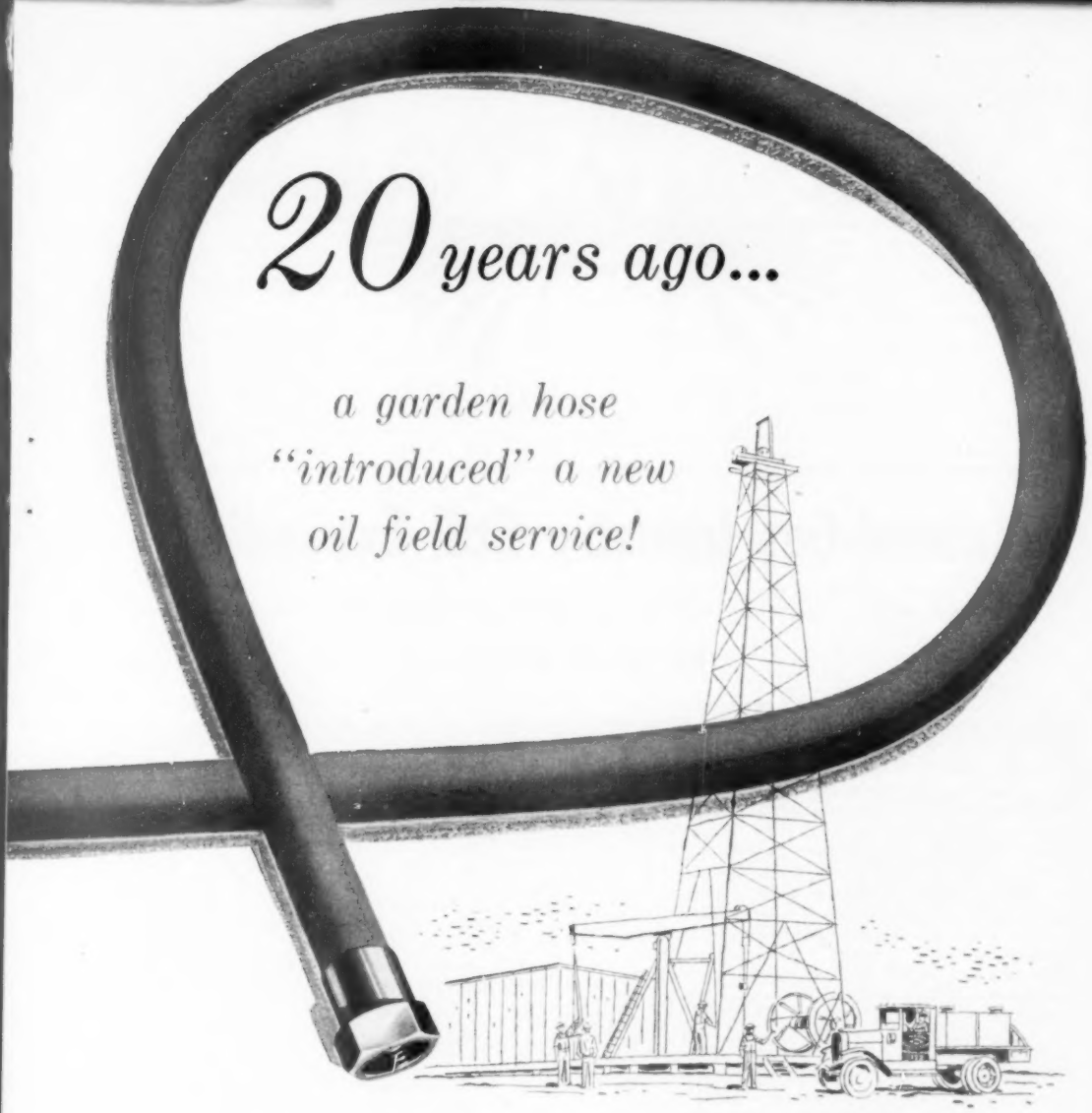
(Daily average in thousands of barrels)

Country—	First 6 mo.		Percentage	First 6
Western Hemisphere:	1952*	1951	change	mo. 1950
Argentina	68.0	68.1	— 0.1	64.0
Bolivia	1.5	1.4	7.2	1.7
Brazil	1.8	1.5	20.0	0.6
Canada	140.5	109.1	28.8	67.9
Chile	2.2	1.7	29.4	1.9
Colombia	106.0	106.4	— 0.4	87.6
Cuba	0.1	0.3	—66.7	0.4
Ecuador	7.8	7.2	8.3	7.3
Mexico	218.0	209.2	4.2	190.1
Peru	46.0	43.2	6.5	40.3
Trinidad	57.0	56.2	1.4	56.4
Venezuela	1,830.0	1,673.0	9.4	1,406.3
Total	2,478.9	2,277.3	8.9	1,924.5
Europe and N. Africa:				
France	6.7	4.8	39.6	1.7
French Morocco	2.1	1.4	50.0	0.8
Germany	31.6	24.7	27.9	20.6
Italy	0.8	0.3	166.7	0.2
Netherlands	13.9	13.9		13.8
Egypt	45.5	44.2	2.9	44.5
United Kingdom	1.1	0.9	22.2	1.0
Total	101.7	90.2	12.8	82.6
Middle East:				
Bahrein	30.0	30.1	— 0.3	30.1
Iran	30.0	658.9	—95.4	662.9
Iraq	305.0	171.0	78.4	120.2
Kuwait	739.0	445.8	65.8	310.5
Qatar	65.0	46.5	39.8	28.4
Saudi Arabia	857.0	671.2	27.7	489.1
Turkey	0.4	0.3	33.3	0.6
Total	2,026.4	2,023.8	0.1	1,641.8
Other Asia:				
British Borneo	106.0	102.0	3.9	77.6
Burma	2.2	2.0	10.0	1.0
India	5.0	5.0		5.2
Indonesia	159.0	146.6	8.5	127.4
Japan	6.0	6.6	— 9.1	5.3
New Guinea	4.8	4.8		4.8
Pakistan	3.0	3.2	— 6.2	2.6
Total	286.0	270.2	5.8	223.9
Total, foreign less Russia and other Communist areas	4,893.0	4,661.5	5.0	3,872.8
Estimated Russia, and other Communist areas:				
Austria	44.0	37.0	18.9	27.0
Romania	90.0	85.0	5.9	82.0
Russia	880.0	790.0	11.4	730.0
Other Communist†	26.2	24.5	6.9	23.0
Total	1,040.2	936.5	11.1	862.0
Total, foreign	5,933.2	5,598.0	6.0	4,734.8

*Partly estimated. †Includes Poland, Czechoslovakia, Hungary, Albania, Yugoslavia, and China.

20 years ago...

a garden hose "introduced" a new oil field service!



It was just an ordinary forty-foot piece of garden hose. Yet, this was the first piece of equipment used by The Dow Chemical Company to introduce inhibited acid into an oil well in central Michigan. The date, February 11, 1932, marked the *beginning of acidizing service* to the oil industry.

Twenty years and over 100,000 acidizing jobs later, Dowell Incorporated, organized as a subsidiary of Dow, is continuing to work with the oil industry to improve production practices. From that start with a garden hose, Dowell has developed special equipment, techniques and a staff of experienced engineers to help the search for better methods of utilizing reservoir energy.

Today Dowell research continues to cooperate with the industry by providing new materials and new methods to solve oil field problems. Among the many valuable contributions Dowell has made are Selective Acidizing . . . the Electric Pilot Services . . . Perfo-Jet Service with the Glass Gun . . . Jel-X Service . . . Jelflake . . . Paraffin Solvents . . . Bulk Inhibited Acid . . . Maintenance Cleaning Service for Heat Exchange Equipment.

When you "Look to Dowell", you'll find a sincere and active desire to put experience, knowledge and abilities to work for you.

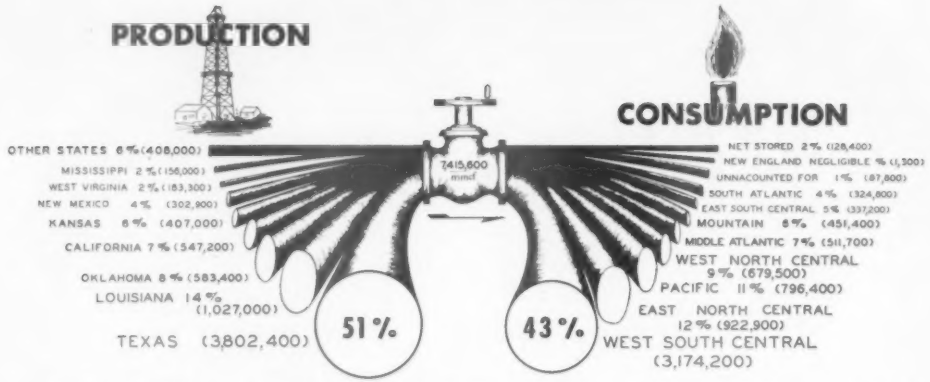
DOWELL INCORPORATED

TULSA 1, OKLAHOMA

A Subsidiary of The Dow Chemical Company

Look to **DOWELL**

FOR OIL INDUSTRY CHEMICAL SERVICE



Natural-gas production and consumption in millions of cubic feet. (Based on Bureau of Mines figures for 1951.)

Natural-Gas Industry Still Expanding

All major sections of nation are now served or are scheduled for early service

by Dahl M. Duff

ALTHOUGH the competition for new franchise territory is practically at an end, the natural-gas industry is still expanding its position as a supplier of energy in the United States.

During the first quarter of this year, approximately 16.3 billion cubic feet of natural gas daily was moving into the utility lines of the country. This total of utility sales was some 10 per cent over 1951. The increase over 1950's first quarter was 32 per cent.

Much of this gain was due to the growing number of customers of the natural-gas distributors, including those from manufactured-gas system conversions, rather than to the seasonal weather factor. In fact, the increased utility sales of natural-gas were accomplished in spite of the above-normal winter temperatures for the last few years.

Utility sales of natural gas amounted to 14,861,000,000 therms during the first 3 months of this year (the therm equals 100,000 B.t.u.'s, or approximately 100 cu. ft.), according to the American Gas Association's statistical department. During this winter period of heavy space-heating demand, 43 per cent of the total sold went to residential customers, and 42 per cent to the industrial users. The remainder was sold to the commercial classification (12 per cent), and to the miscellaneous group, mainly government agencies.

A 10 per cent gain in sales is a somewhat conservative figure for the natural-gas business considering the spectacular strides it has made since the end of the war. However, if no more than this increase is continued through the remainder of the year, total marketed production during 1952 will amount to about 8,157 billion cubic feet, including the nonutility users.

The Bureau of Mines new quarterly natural-gas reports give a preliminary marketed production total for 1951 of 7,416 billion cubic feet. Of this, 128 billion cubic feet was added to the country's gas-storage areas, 3,495 billion taken by industrial users, 1,364 billion in field use, 422 billion by carbon-black plants, and 1,471 billion by residential gas customers.

Of the total marketed production last year, Texas supplied 3,802 billion cubic feet, or approximately 51 per cent. Louisiana provided 1,027 billion cubic feet, or about 14 per cent. Next were Oklahoma, 583 billion; California, 547 billion, and Kansas, 407 billion.

All major sections of the country with the exception of the Pacific Northwest and northern New England are now served by natural gas or due to receive service in the near future. Leaders of the industry, as well as outside observers, however, see no appreciable slackening in the rate of the industry's growth.

Demand Far from Satisfied

Demand for natural gas remains far from satisfied as is shown by the continued necessity for winter curtailment of certain service and various restrictions on the number of customers that can be added to the mains. The transmission companies can look ahead to a period of expanding existing capacity by looping lines and installing more compressor-station horsepower.

The current but improving shortage of steel and line pipe has the effect of throwing still further into the future any stabilization of the natural-gas supply-demand relationship. The steel situation is largely reflected in the drop in Federal Power Commission authorizations during the last half of 1951. Commission approvals then involved 1,463 miles of line, 90,600 hp., and $86,499,000 expenditures, against 4,328 miles, 335,800 hp., and $384,884,000 expenditures during the first half of the year. Allocations of the Petroleum Administration for Defense were directed toward

Makes tough jobs "a steel pipe cinch"!

Whether it's hauling pipe or heavy gear, an International makes every tough job a "cinch."

Internationals are built to stand up through your roughest jobs, at less operating and maintenance cost. The reason? Engineering—the kind that has kept International the heavy-duty leader for 20 straight years.

So, you can expect consistently high performance and longer truck life, plus greater driver comfort and easier handling.

See your International Dealer or Branch soon, and start saving money!

INTERNATIONAL HARVESTER COMPANY · CHICAGO

Look for these International exclusives:

- Powerful, dependable, economical gasoline, diesel or LPG power plants for rough, tough going.
- New green tinted non-glare safety glass available in the Comfo-Vision Cab—the roomiest, most comfortable cab on the road. One piece, full-vision windshield.
- Super-steering system—more positive control. Wider front axles make possible full 37° turning angle for easier handling and greater maneuverability.
- 115 basic models . . . everything from ½-ton pickups to 70,000 lb. GVW ratings.
- America's largest exclusive truck service organization.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers

Better roads mean a better America

INTERNATIONAL TRUCKS

"Standard of the Highway"

channeling available pipe into the most urgently needed projects; others were deferred.

For the second quarter of 1952, PAD provided 174,520 tons of large-diameter pipe for five major natural-gas projects, and an additional 132,908 tons for several hundred smaller lines. The five major projects were: (1) extension of Tennessee Gas Transmission's system to the New York - Massachusetts line and loops to add capacity in the critical Appalachian region and northward; (2) additions to United Gas Pipe Line's system to make almost a billion cubic feet additional available for East and Middle West transmission companies; (3) extensions of Texas Eastern Transmission's system to improve Appalachian supply and later that in New England; (4) extensions and looping to Texas Gas Transmission's Texas-to-Ohio system; and (5) a 100-mile Lone Star Gas Co. line from storage fields to Dallas and Fort Worth.

Of a total of 38,635 trillion B.t.u.'s of energy supplied in the United States last year, natural gas accounted for 7,955 trillion on the basis of total marketed production. Bureau of Mines data show that 14,050 trillion were from liquid petroleum, and the rest from coal, lignite, and water power. Thus, natural gas furnished slightly more than 20 per cent of the total. However, natural gas is not competitive with petroleum and coal when used as a transportation fuel such as in automobiles, ships, and railroads. When these uses are deducted, natural gas is shown to provide around 28 per cent of the stationary, energy needs of the country. Twenty years ago, when a substantial percentage of the total marketed gas was made up of the manufactured product, gas furnished only about 9½ per cent of the total energy requirements of all kinds.

Serious Problems Beset Industry

A number of serious problems confronted the natural-gas industry as it moved into the second half of this year. Some of these were legal and political, others were of a technical and operating nature. The economics of the business, especially on the sales and financial side, are under continuing study as a result of a high degree of cooperation between the American Gas Association and its member companies. The A.G.A. has only recently embarked on a comprehensive study of the economics of house heating, involving, among other things, an effort to correlate weather changes more closely with gas demand.

Another problem for the industry, and one perhaps even more urgent, concerns the industry's rates for gas service. This question goes deep into the present dislocated economic structure of the natural-gas business. Gas is a regulated utility industry subject to both state and federal agencies whose operations incidentally sometimes conflict. On the other hand, gas competes with unregulated coal and oil. Government price indexes show gas rates have been held far below other major commodities. Gas and electricity are at 97.9 per cent of the 1935-39 base, while the average of all items is 188.0. .

Steadily rising costs, higher charges for borrowing money, and increases in field prices for gas have given urgency to the requests for rate increases which are before the regulatory agencies. The interstate pipeline companies had asked rate hikes aggregating more than $100,000,000 in petitions pending before FPC this spring, and gas-industry leaders were becoming increasingly active in carrying their case to the public.

The gas industry sees no reason why its premuim fuel should be sold at the cheapest prices in relation to competitors. In many sections of the country, particularly those closer to the fields in the Southwest, this disparity in prices has been an enormous factor in stimulating the demand for gas. How much gas demand would be throttled back by wholesale rises in rates is a question.

Although there has been talk of presenting a joint industry case for higher rates, adjustments are more likely on a company-by-company basis. Like any increase in prices, high gas rates meet considerable consumer opposition, and the industry more and more is feeling the need of a public-relations and educational program in this respect. If facilities are to be expanded, users must be prepared to pay enough to attract the necessary capital. Transcontinental, which supplies New York City through a 1,840-mile line from Texas, has a program to increase system capacity by more than a half a billion cubic feet daily, but some of it is contingent on favorable FPC action to increase rate of return above the present 6 per cent limitation.

Field Prices Continue Upward

Field prices for natural gas have continued to move up sharply but the net effect on the consumer is small since by far the larger part of the final cost of gas is in transmission and distribution. Ten years ago the well-head price for natural gas averaged around 4½ cents per M.c.f. New contracts now call for 12 or 13 cents, and one large producer has set 15 cents as the figure at which it will sell on future contracts. However, these increases of 6 cents or more over the last 10 years are relatively small increments of the total $1.30 paid by a residential consumer in, say, Milwaukee. The bulk of the costs is in distribution, and in transmission. Line costs, which pipe liners in 1941 roughly averaged at about $1,000 per inch-mile, now are estimated at between $1,850 and $2,500 per inch-mile.

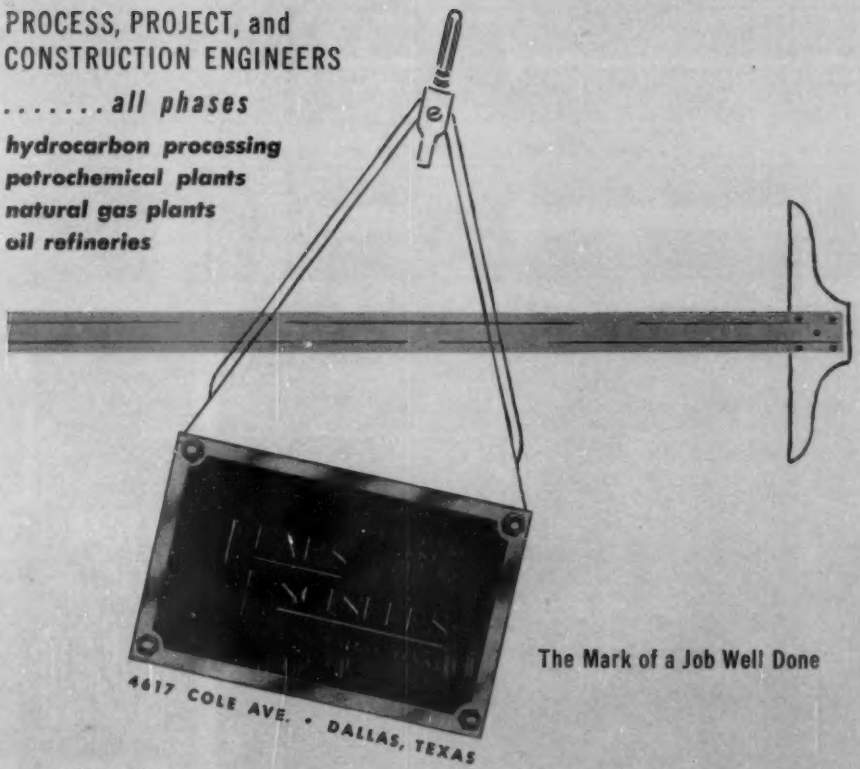
The increases which have occurred in field prices are recognition of the higher costs of gas exploration and production, plus the fact that competition for available reserves has made them possible. The requirements of dedicated reserves have taken a substantial part of the economically located gas reserves of the Southwest. Last year's marketed production of some 5.8 trillion cubic feet, excluding field and carbon-black use, would call for dedicated reserves of about 88 trillion cubic feet on a 15-year basis, and 118 trillion cubic feet on a 20-year basis. Gas reserves of all kinds were estimated at 194 trillion cubic feet at the end of last year.

Although the prospective steady enlargement of gas reserves will tend to relieve this problem during coming years, it is complicated by the continuing doubt as to FPC jurisdiction over gas production. Several large oil companies holding important gas reserves have refused to sell to domestic interstate transmission companies since they cannot risk being subjected to FPC control over all their operations. President Truman's veto of the Kerr bill left this question unsettled, and a recent estimate was that of the 106 trillion cubic feet of gas along the Texas and Louisiana Gulf Coasts, at least 30 trillion in the hands of three of four large oil companies remains uncommitted to any gas company.

PROCESS, PROJECT, and
CONSTRUCTION ENGINEERS

. . . . . all phases

hydrocarbon processing
petrochemical plants
natural gas plants
oil refineries

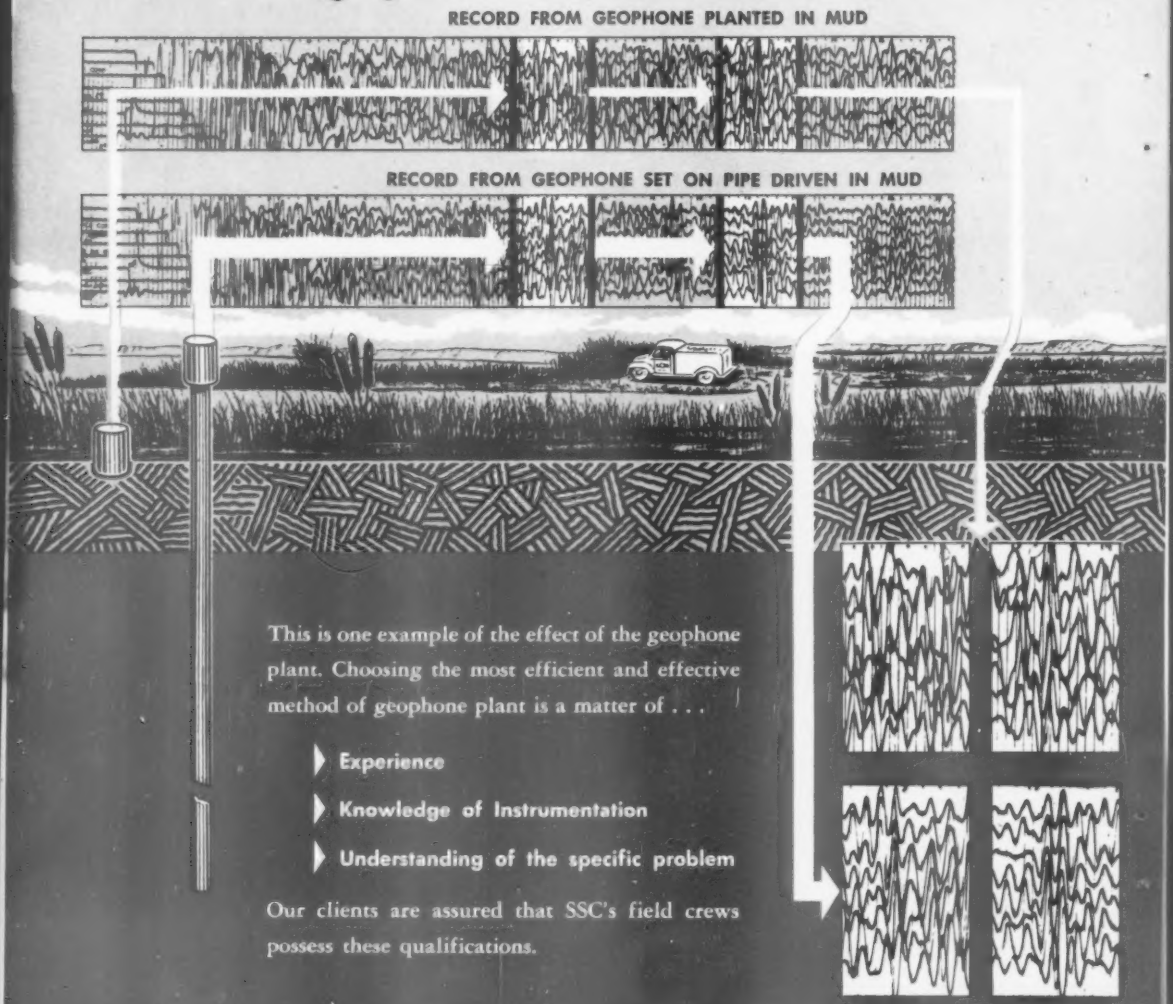


The Mark of a Job Well Done

4617 COLE AVE. • DALLAS, TEXAS

Basic Methods of Improving Seismic Records . . .

The Effect of GEOPHONE PLANT



This is one example of the effect of the geophone plant. Choosing the most efficient and effective method of geophone plant is a matter of . . .

- Experience
- Knowledge of Instrumentation
- Understanding of the specific problem

Our clients are assured that SSC's field crews possess these qualifications.

Seismograph Service Corporation

Seismic Surveys — Gravity Surveys — Pilot Crews — Lorac

TULSA 1, OKLAHOMA, U.S.A.

Pipe-Line Expansion to Exceed 41,000 Miles; Natural Gas Shows Biggest Gain

Proposed long pipe lines indicate much expansion in 1952-1953 in laying pipe and building stations

WITH a total of 41,000-plus miles of pipe-line projects completed, under way, and proposed it appears the whole world is laying pipe line. However, Russian data are not available.

Counting up the total from the current Journal survey of pipe-line construction, prove 1952 thus far to be expansive.

Gaining ground in the various types of pipe-line projects, domestic natural gas leads the field with 14,500 miles of programs planned and under way; 2,203 miles are completed.

Domestic crude-oil lines are in the middle category of activity with a total mileage of 8,500 under way and planned; 530 miles completed.

Domestic products lines planned and under way are at the 5,000-mile mark; 1,153 miles completed.

Foreign gas lines planned and under way total 4,300 miles.

Foreign crude systems planned and under way add up to 2,800 miles with 222 miles completed.

Foreign products carriers planned and under way total 1,600 miles.

Major projects on the docket for 1953 construction show the endeavor of pipe liners in furthering their operations to extensive systems running into thousands of miles. These will provide needed service to many systems.

Some of these thousand-milers are:

Gulf Interstate Gas Co.'s 1,000 mile, 30-in., project from the Gulf Coast into northern Kentucky.

Southern Natural Gas Co.'s 1,255-mile, 24 on down to 4-in., looping program in Louisiana, Mississippi, Alabama, and Georgia.

Texas-Ohio Gas Co.'s 1,350-mile, 30-in., from Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky, on to Spencer, W. Va.

United States Pipe Line Co.'s 1,000-mile crude-line proposal, from the Gulf Coast via Memphis and Nashville, and Lexington and Paducah, Ky., to Cincinnati.

On the northern front, Westcoast Transmission Co., Ltd., (a Canadian company) has planned a 1,110-mile, 24-in., natural gas line from Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton, and Vancouver to Portland, Ore.

Some big proposed ventures in carriers below the 1,000-mile mark to be noted are Progress Pacific Pipe Line Co.'s 900-mile, 24-in., crude line from Permian basin, West Texas, to California, and this same company's 900-mile, 12-16-in., products line from California to West Texas.

And there is West Coast Pipeline Co. plans for a crude line of 986 miles, 20-22-in., from Synder, Tex., to Norwalk, Calif.

TABLE 1—PRINCIPAL DOMESTIC CRUDE-OIL PIPE-LINE PROJECTS PLANNED AND UNDER WAY

Company—	Miles	Inch	Status	Contractor, location, and completion date
Cities Service Pipe Line Co.	64	18	Planned	Sour Lake, Tex., to Lake Charles, La. 1-1-53.
Continental Pipe Line Co.	105	8	Contracted	Western Construction Co.—Rincon to northwest of Sullivan City on to Port Isabel, Tex. 9-30-52.
Continental Pipe Line Co.	217	12	Planned	Wichita Falls, Tex., to Ponca City, Okla. 1952.
Cooperative Refinery Association	48	6	Planned	Phillipsburg, Kans., to Holdredge, Neb.
Gulf Refining Co.	80	24	Planned	Midland to Colorado City, Tex.
Gulf Refining Co.	22	10	Planned	Wortham to Corsicana, Tex.
Humble Pipe Line Co.	....	4 to 12	Planned	Upton and Reagan counties.
Humble Pipe Line Co.	201	12-18	Planned	Hawkins to Baytown, Tex.
Interstate Oil Pipe Line Co.	68	16	Planned	Raceland to Anchorage, La. 11-52.
Interstate Oil Pipe Line Co.	18	12	Planned	LaRose to Raceland, La. 10-52.
Interstate Oil Pipe Line Co.	55	16	Planned	Sunset to Anchorage, La. 12-52.
Interstate Oil Pipe Iine Co.	21	12	Planned	Duck Lake and Bayou Sale to New Iberia, La. 9-52.
Interstate Oil Pipe Line Co.	63	12-16	Planned	Flora to Bunkie, La. 12-52.
Interstate Oil Pipe Line Co.	42	4-6-10	Under way	Latex of Georgia—Esperance Pt., Fairview and Lismore Landing, La., to Cranfield, Miss. 8-15-52.
Interstate Oil Pipe Line Co.	30	16	Planned	Moore to Flora, La. 1953.
Malco Refineries, Inc.	60	4	Under way	Pettigrew, Tocito field to Hospah field (San Juan basin, New Mexico).
Ohio Oil Co.	150	12	Under way	Conyes Const.—Lima to E. Sparta, Ohio. 11-52.

COOPER-BESSEMER V-ANGLES ON THE JOB

Conserving Gas and Dollars

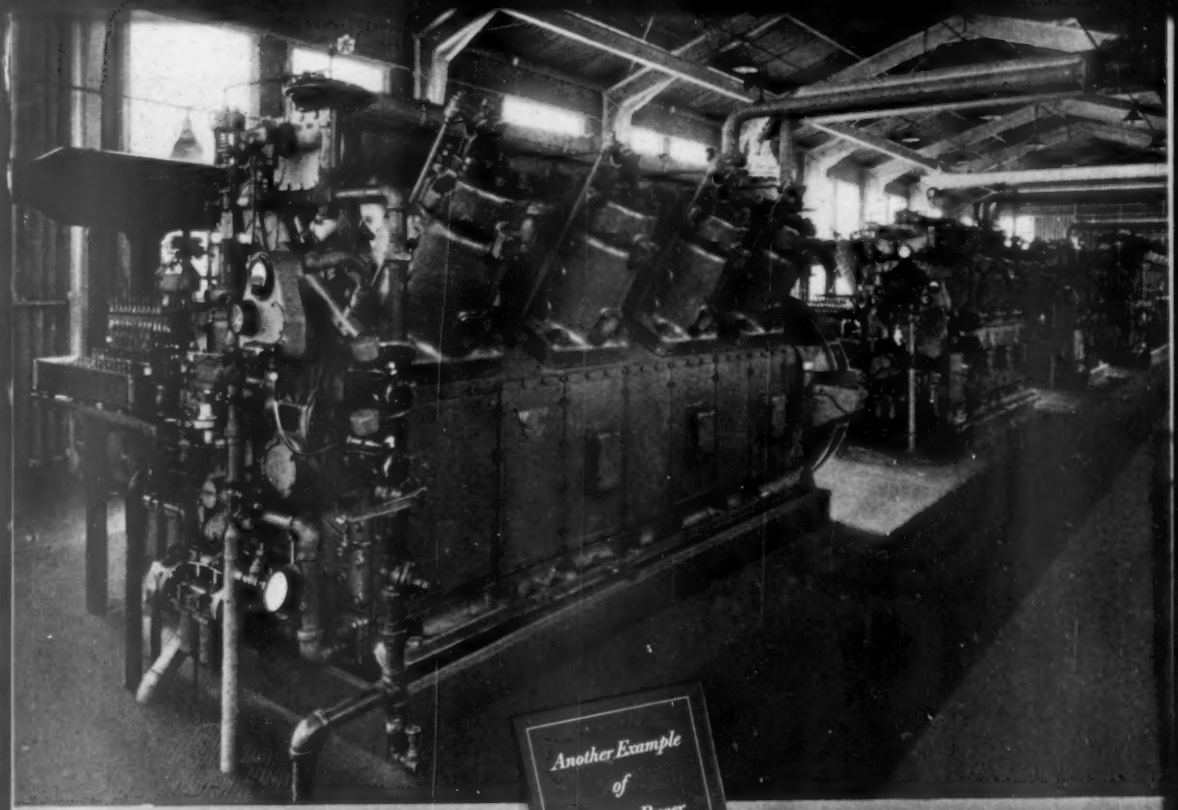
AT LONE STAR GAS COMPANY'S KATIE PLANT

THE answer to efficient, low-cost compressor service at Lone Star Gas Company's gasoline extraction plant in the Katie Field is this 2,560-horsepower line-up of Cooper-Bessemer V-angles. These units, 3 GMX's and a GMV, compress casinghead and low pressure distillate gas from about 60 psi suction to 415 psi discharge, for delivery to the absorber.

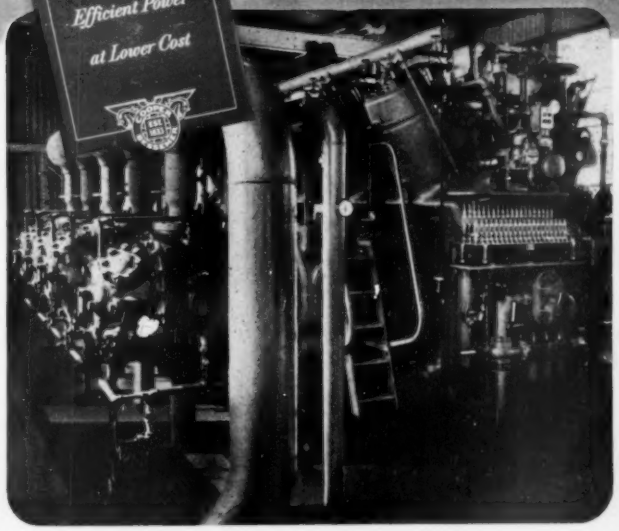
Of particular interest, the engines have automatic speed control and drive compressor cylinders selected for a wide range of operation without the use of unloading equipment. Add to this the fact that *every crankthrow*, all down the line, drives a compressor cylinder. Here's an economical, easy-to-maintain setup that makes the most of Cooper-Bessemer V-angle compactness.

Compressors

New York Washington, D. C. Bradford, Pa. Parkersburg, W. Va.
San Francisco, Cal. Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle, Wash.



Another Example of Efficient Power at Lower Cost



ABOVE: This line of Cooper-Bessemer V-angles in Lone Star Gas Company's Katie Plant consists of two 440 hp GMX-8 units, a 330 hp GMX-6 and a 1,350 hp GMV-10.

RIGHT: Note in this close-up of the GMV-10 that each of the 5 engine crankthrows drives a compressor cylinder — a space-saving V-angle feature.

LEFT: Compressor building at Lone Star Gas Company's Katie Field Plant housing 2,560 Cooper-Bessemer V-angle compressor horsepower.

by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela

SEI
OUR 20TH YEAR
1932-1952—The operations of SEISMIC span two decades of the industry's most intensive search for oil. This abundance of experience provides extra assurance that your geophysical exploration program is in good hands at SEI.
SEISMIC
EXPLORATIONS
INCORPORATED
1007 South Shepherd,
HOUSTON, TEXAS

TABLE 1—PRINCIPAL DOMESTIC CRUDE-OIL PIPE-LINE PROJECTS PLANNED AND UNDER WAY (Continued)

Company—	Miles	Inch	Status	Contractor, location, and completion date
Ohio Oil Co.	65	10	Under way	Conyes Const.—Harpster to Newark, Ohio. 11-52.
Pan American Pipe Line Co.	40	14	Planned	Arden station in Irion County to Eldorado station in Schleicher County, Texas. 10-52.
Pan American Pipe Line Co.	27	26	Planned	Genoa to Texas City, Tex. 12-52.
Pasotex Pipe Line Co.	195	8	Under way	El Paso to Wink, Tex.
Platte Pipe Line Co.	1,075	16-20	Under way	Worland, Wyo., to Wood River Ref. area in Illinois.
Platte Pipe Line Co.	573	16-20	Under way	(Section 1-2-3-4) R. H. Fulton & Co., Worland, Wyo., to Holdredge, Neb.
Platte Pipe Line Co.	142	20	Under way	(Section 5) Fulton and Brodie—Holdredge, Neb., to Kansas State Line.
Platte Pipe Line Co.	100	20	Under way	(Section 6) Rumsey Bros. Northern edge of Kansas.
Progress Pacific Pipe Line Co.	900	24	Proposed	Permian basin, West Texas, to California.
Rancho Pipe Line System	455	24	Contracted	McCamey to Houston, Tex.
Rancho Pipe Line System	267		Contracted	Anderson Bros. Corp.—McCamey to Cedar Valley near Austin, Tex.
Rancho Pipe Line System	190	24	Contracted	Houston Contracting Co.—Austin to Deer Park Ref. (Houston).
Rancho Pipe Line System	64	24	Under way	Okla. Pipe Line Constructors—Deer Park Ref. west to Brazos River.
Rancho Pipe Line System	126	24	Under way	Houston Contracting Co.—Brazos River west to Austin.
Roosevelt Oil & Refining Corp.	22	4-6	Planned	St. Helens to Norwich, Mich.
Service Pipe Line Co.	33	16	Planned	Bowie, Tex., to Drumright, Okla.
Service Pipe Line Co.	170	12	Proposed	Tioga to Williston, N. D.
Service Pipe Line Co.	29	4-6-8	Proposed	Natrona County, Wyoming.
Service Pipe Line Co.	30	6	Proposed	Knox and Haskell counties, Texas.
Shell Pipe Line Corp.	42	8	Planned	Hallettsville to LaGrange, Tex. 1953.
Sinclair Pipe Line Co.	674	22-24	Under way	Drumright, Okla., to E. Chicago, Ind.
Sinclair Pipe Line Co.	150	24	Under way	O. R. Burden Const. Co. (Segment 1), Cushing, Okla., to Humboldt, Kans.
Sinclair Pipe Line Co.	60	24	Under way	(Spread 1) Caney to Humboldt, Kans.
Sinclair Pipe Line Co.	90	24	Under way	(Spread 2) Cushing, Okla., to Caney, Kans.
Sinclair Pipe Line Co.	180	24	Under way	R. H. Fulton (Segment 2)—Humboldt, Kans., to Salisbury, Mo.
Sinclair Pipe Line Co.	176	22	Under way	O. R. Burden (Segment 3)—Salisbury, Mo., to Forest City, Ill.
Socony-Vacuum Oil Co., Inc.	20	8-10	Under way	Brown-Lite—Hutchinson, Kans.
Southern California Edison Co.	41	8	Under way	J. E. Young Pipe Line Contr., Inc.—Etiwanda to Santa Fe Springs, Calif. 10-15-52.
Sterling Pipe Line System	53	12	Under way	Sterling, Colo., to connection with Platte Pipe Line at Gurley, Neb. (includes 20 miles, 10-in., main line; 35 miles, 8-in., branch lines).
Sun Pipe Line Co.	99	4-6-8	Proposed	Scurry County, Texas.
Sun Pipe Line Co.	34	8	Planned	Jameson to Colorado City, Tex.
Sun Pipe Line Co.	20	8	Planned	Claytonville to Colorado City, Tex. 11-1-52.
Texas Pipe Line Co.	319	22-12-10	Under way	Houston Contracting Co.—Louisiana Gulf Coast to Port Arthur, Tex. Summer 1952.
Texas Pipe Line Co.	86	22	Under way	Houston Contracting Co.—Gueydan east to Morgan City.
Texas Pipe Line Co.	160	30-12-10-8	Under way	Houma, La., south through Terrebonne Bay.
Texas Pipe Line Co.	175	16	Under way	Smith Contracting Corp.—Corsicana to East Houston.
Toronto Pipe Line Co.	100	6-10-12	Planned	Merino, Colo., to Gurley, Neb. 10-31-52.
Union Oil Co. of California	40	8-10	Planned	San Joaquin Valley and Los Angeles basin.
West Coast Pipeline Co.	986	20-22	Planned	Snyder, Tex., to Norwalk, Calif.
West Texas Gulf Pipe Line Corp.	467	24-26	Under way	Anderson Bros.—26-in. Colorado City to Wortham, Tex., 24-in., Wortham to Sour Lake, Tex. 10-52.
West Texas Gulf Pipe Line Corp.	114	20	Planned	Wortham to Longview, Tex. 10-52.
West Texas Gulf Pipe Line Corp.	44	26	Under way	Anderson Bros.—Glenrose, Tex., area.
West Texas Gulf Pipe Line Corp.	60	26	Contracted	Anderson Bros.—Colorado City to Abilene, Tex.
West Texas Gulf Pipe Line Corp.	94	26	Contracted	Anderson Bros.—West of Wortham, Tex.
West Texas Gulf Pipe Line Corp.	120	26	Contracted	Associated Pipe Line Contractors, Inc.

TABLE 2—PRINCIPAL DOMESTIC PRODUCT PIPE-LINE PROJECTS PLANNED AND UNDER WAY

Bell Oil & Gas Co.	150	6	Planned	Ardmore to Drumright, Okla.
Bell Oil & Gas Co.	114	8	Planned	
Bell Oil & Gas Co.	32	6	Planned	
Buckeye Pipe Line Co.	430	14	Under way	Linden, N. J., to Allentown, Pa., on to New York. 1953.
Buckeye Pipe Line Co.	77	16	Under way	H. L. Gentry Const. Co.—Macungie, Pa., to Linden, N. J. 10-15-52.
Coastal Products Pipe Line Co.	260	20	Planned	Houston to Baton Rouge.
Derby Oil Co.	30	4	Under way	Wichita to Bell, Kans. 9-1-52.
Keystone Pipe Line Co.	60	12	Proposed	Pt. Breeze, Pa., to Montello, Pa. 12-31-52.
Ohio Oil Co.	255	8-10	Proposed	Conyes Const.—East St. Louis, Ill., to Indianapolis. 11-52.
Phillips Petroleum Co.	50	8	Planned	Goldsmith to Spraberry, Tex. 11-52.
Phillips Petroleum Co.	36	6-8	Planned	Spraberry to Benedum, Tex. 10-52.
Phillips Pipe Line Co.	35	6	Planned	Smith Contracting Co.—Okmulgee to Tulsa. 10-52.

TABLE 2—PRINCIPAL DOMESTIC PRODUCT PIPE-LINE PROJECTS PLANNED AND UNDER WAY (Continued)

Company—	Miles	Inch	Status	Contractor, location, and completion date
Phillips Pipe Line Co.	68	12¾	Under way	Brown Lite Co.—Osawatomie, Kans., westward towards Wichita.
Pioneer Pipe Line Co.	310	8	Under way	Sinclair, Wyo., to Salt Lake City, Utah.
Progress Pacific Pipe Line Co.	900	12-16	Proposed	California to W. Texas.
Salt Lake Pipe Line Co.	330	8	Planned	Salt Lake City, Utah, to Boise, Idaho. 12-1-52.
Shell Oil Co.	565	14-8	Contracted	R. B. Potashnick—Wood River via East Chicago to Detroit. 1952.
Shell Oil Co.	35	14	Contracted	Beecher to Argo, Ill.
Standard Oil Co. (Ind.)	316	12	Planned	Bills and Troth Const. Co.—Sugar Creek, Mo., to Dubuque, Iowa. 1-1-53.
Sun Pipe Line Co.	110	8	Under way	Fostoria to Hudson, Ohio.
Susquehanna Pipe Line Co.	123	6-8	Planned	Fostoria to Randolph, Ohio.
Tuscarora Oil Co., Ltd.	74	6-10-12	Under way	Allentown to Midland, Pa.
United States Pipe Line Co.	1,000	..	Planned	Gulf Coast via Memphis, Nashville, Tenn., Lexington and Paducah, Ky., to Cincinnati.

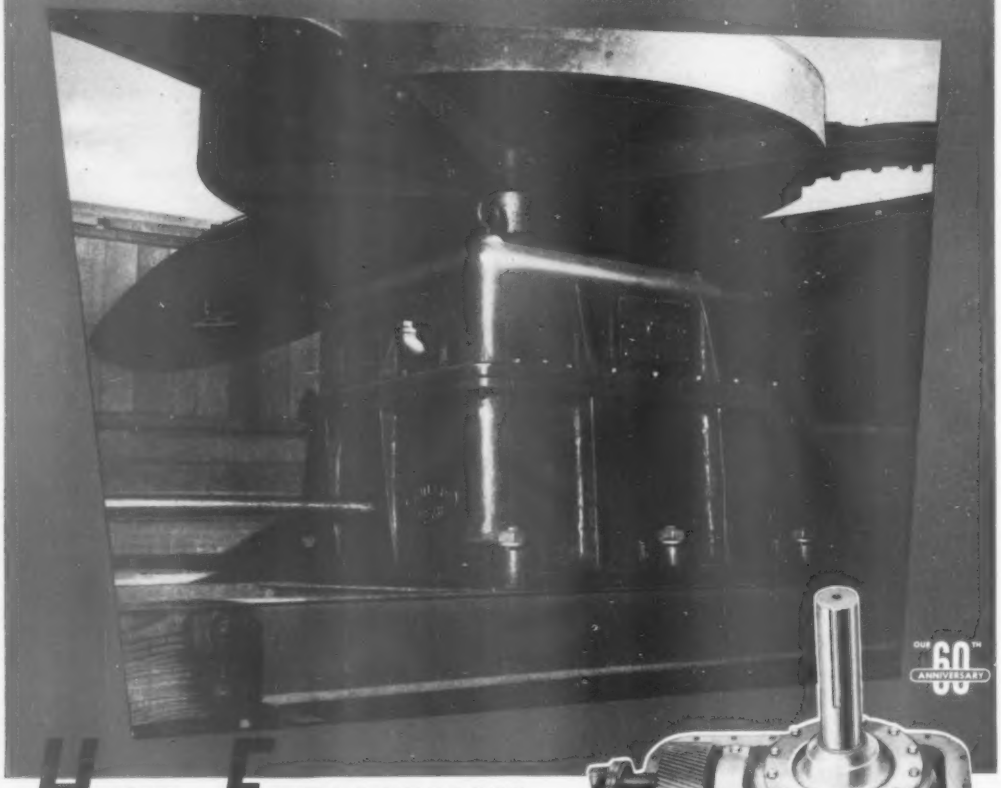
TABLE 3—PRINCIPAL DOMESTIC NATURAL GAS PIPE-LINE PROJECTS PLANNED AND UNDER WAY

Algonquin Gas Transmission Co.	160	24-26	Under way	Williams Bros.—New Jersey to Connecticut River near New Haven. 8-1-52.
Allied Gas Co.	24	6	Planned	McLean to Champaign County, Illinois.
Arkansas-Missouri Power Co.	140	2-10	Planned	Arkansas and Missouri.
Associated Natural Gas Co.	88	..	Planned	Missouri.
Carolina Natural Gas Co.	185	2-12	Planned	Lateral lines off Transcontinental in North and South Carolina.
Cities Service Gas Co.	21	26	Planned	Franklin and Anderson counties, Kansas.
Coast Counties Gas & Electric Co.	40	3-4-8	Planned	Coast and Valley region, California.
Colorado Interstate Gas Co.	250	20	Under way	R. H. Fulton & Co.—Kit Carson, Colo., to Amarillo, Tex.
Commonwealth Natural Gas Corp.	537	20	Planned	West Bend, Ky., to Norfolk, Va.
East Tennessee Natural Gas Co.	172	22	Planned	Greenbrier to Oak Ridge, Tenn.
East Tennessee Natural Gas Co.	100	16	Planned	Knoxville to Kingsport, Tenn.
El Paso Natural Gas Co.	133	30	Planned	Looping along Texas, New Mexico, and Arizona existing line.
El Paso Natural Gas Co.	36	24	Planned	Looping from Kingman to Franconia, Ariz.
Frederick Gas Co., Inc.	26	4	Planned	Redlands to Frederick, Md.
Georgia Gas Co.	32	4	Proposed	Bogart to Gainesville, Ga.
Glacier Gas Co.	285	20	Planned	Pincher Creek field, Alta., Canada, to area in northwestern Montana, northern Idaho, and eastern Washington.
Glacier Gas Co.	120	16	Planned	Spokane to Hanford, Wash.
Glacier Gas Co.	91	8	Planned	Spokane to Lewiston, Idaho.
Glacier Gas Co.	130	12	Planned	Spokane to International Boundary at Trail, British Columbia.
Grand Valley Pipe Line Co.	105	8-10	Contracted	Piceance Creek field to Rifle on to Grand Junction.
Gulf Interstate Gas Co.	1,000	30	Planned	Gulf Coast to North Kentucky.
Home Gas Co.	32	..	Planned	Breesport to Union Center, N. Y.
Hope Natural Gas Co.	33	6-10-12	Planned	Wyoming County, West Virginia, southerly to Buchanan County, Virginia.
Houston Pipe Line Co.	50	16	Planned	Edna to Tom O'Connor. 9-1-52.
Interstate Power Co.	26	8	Proposed	From Natural Gas P. L. Co. of America line near Hoopole, Ill., to Clinton, Iowa.
Iowa-Illinois Gas & Electric Co.	41	10	Planned	Washington County to Cedar Rapids, Iowa.
Iowa-Illinois Gas & Electric Co.	....	6	Under way	C. E. Wilson Const. Co.—Davenport, Iowa, and Moline, Ill.
Kansas-Nebraska Natural Gas Co., Inc.	179	..	Planned	Kansas and Nebraska.
Kansas-Nebraska Natural Gas Co., Inc.	49	10	Planned	Ogallala to North Platte, Neb.
Kansas-Nebraska Natural Gas Co., Inc.	20	12	Planned	Atwood to near Oakley, Kans. 1952.
Kansas-Nebraska Natural Gas Co., Inc.	39	4-6	Planned	Jayhawk Const Co.—Neligh to O'Neil, Neb. 1953.
Kansas-Nebraska Natural Gas Co., Inc.	20	16-12	Planned	Hastings to Grand Island, Neb. 1952.
Kansas-Nebraska Natural Gas Co., Inc.	18	6-8	Planned	McCook, Neb., southward. 1952.
Kansas-Nebraska Natural Gas Co., Inc.	54	4-6	Planned	Neligh to Hartington, Neb. 1953.
Kansas Power & Light Co.	28	12-16	Planned	M. E. White—North of Kansas to Meade County gas field. 8-1-52.
Lake Shore Pipe Line Co.	45	10	Under way	Harford Bros.—Northwesterly from T.G.T. system near Meadville, Pa., to Ashtabula, Ohio.
Lone Star Gas Co.	35	12	Planned	Southeastern Schleicher County.
Manufacturers Light & Heat Co.	40	..	Proposed	Allegheny, Washington, and Beaver counties, Pennsylvania.
Michigan Gas Storage Co.	30	26	Planned	Looping between Laingsburg and Mount Pleasant Junction, Mich.
Mid-South Gas Co.	240	..	Proposed	Greene, Poinsett, Crittenden, St. Francis Lee, Phillips, Monroe, and Woodruff and Cross counties, Arkansas.
Minneapolis Light & Power Co.	20	30	Under way	Williams Bros.—Minneapolis.
Mississippi River Fuel Corp.	40	18	Planned	Dubach to Perryville, La.
Mississippi River Fuel Corp.	96	18-16	Under way	Houston Contracting Co.—Ruston, La., to Marshall, Tex.
Missouri Central Gas Co.	25	6	Contracted	L. R. Young Const. Co.—Moberly to Macon, Mo.
Montana Power Co.	52	16	Planned	Canada-Montana border to Cut Bank, Mont.

TABLE 3—PRINCIPAL DOMESTIC NATURAL GAS PIPE-LINE PROJECTS PLANNED AND UNDER WAY (Continued)

Company—	Miles	Inch	Status	Contractor, location, and completion date
Morganfield Natural Gas Co.	31	4-6	Planned	Through Sturgis, Providence, Clay, Diamond, Wheatcroft, and Sullivan, Ky.
Nevada Natural Gas Pipe Line Co.	114	10	Proposed	Topock, Ariz., to Las Vegas, Nev.
New River Gas Co.	50	..	Planned	Summers or Monroe counties, West Virginia, to Narrows and Dublin, W. Va.
New York State Natural Gas Corp.	104	14-16-20	Planned	Williams-Austin Co.—Looping in Westmoreland, Armstrong, and Tioga counties, Pennsylvania. (Includes 17 miles of 16-in., in Potter County.)
New York State Natural Gas Corp.	52	16	Under way	Williams-Austin Co. Spread 2—Utica to Amsterdam, N. Y.
New York State Natural Gas Corp.	20	20	Under way	Williams-Austin Co. Spread 4—Angelica to Roosburg, N. Y.
New York State Natural Gas Corp.	17	16	Contracted	Williams-Austin Co.—Colesburg Junction to Sabinsville, Pa.
New York State Natural Gas Corp.	48	10	Planned	Williams-Austin Co.—Oneonta and Norwich to DeRuyter, N. Y.
New York State Natural Gas Corp.	21	..	Planned	Columbiana and Stark counties, Ohio.
Niagara Mohawk Power Corp.	55	10	Under way	Williams-Austin—Fulton to Watertown, N. Y. 9-15-52.
Niagara Mohawk Power Corp.	20	10-24	Under way	H. L. Gentry Const. Co.—Syracuse, N. Y. 10-1-52.
Northeastern Gas Transmission Co.	375	20-24	Planned	New Hampshire, Massachusetts, and Connecticut.
Northern Indiana Fuel & Light Co.	33	8	Planned	Edgerton to Auburn, Ind.
Northern Natural Gas Co.	400	24	Planned	Emerson, Manitoba, south to Red River Valley through Fergus Falls on to St. Paul, Minn.
Northern Natural Gas Co.	210	26	Planned	Five loops, Texas-Oklahoma 2 in Kansas and 2 in Nebraska.
Northern Natural Gas Co.	140	4-6-8-12	Under way	Reese Bros. Const. Co.—Gathering system south of Rolla, Kans., to Guymon, Okla.
Northwest Natural Gas Co.	750	..	Planned	Washington, Oregon, and Idaho.
Northwest Natural Gas Co.	373	24	Planned	Eastport, Idaho, to Monroe, Wash.
Northwest Natural Gas Co.	79	18	Planned	Monroe to International Boundary near Lynden, Wash.
Northwest Natural Gas Co.	29	22	Planned	Monroe to near Seattle, Wash.
Northwest Natural Gas Co.	164	20	Planned	Seattle to Portland, Ore.
Ohio Fuel Gas Co.	61	..	Planned	Northern and southwestern Ohio.
Ohio Fuel Gas Co.	22	16	Planned	Dayton, Troy, Piqua, and Sidney, Ohio.
Ohio Fuel Gas Co.	31	20	Planned	Licking County to Richland County, Ohio.
Ohio Fuel Gas Co.	74	3 to 20	Planned	Hocking, Knox, and Ashland counties, Ohio.
Ohio Fuel Gas Co.	47	20	Planned	Benton Township, Hocking County to Columbus, Ohio.
Ohio Fuel Gas Co.	33	20	Planned	Jefferson to Seneca, Ohio.
Oklahoma Natural Gas Co.	35	12	Planned	Henryetta to Morris, Okla., and Bethany to El Reno, Okla.
Pacific Gas & Electric Co.	141	34	Planned	Parallel sections along Topock-Milpitas line.
Pacific Gas & Electric Co.	44	8	Under way	W. M. Lyles & Co. crews—Salinas to King City. 1952.
Permian Basin Pipeline Co.	384	20-30	Planned	Permian basin area to eastern New Mexico, on to Skellytown, Carson County, Texas.
Permian Basin Pipeline Co.	139	..	Planned	Upton County, Tex., to Lea County, N. M.
Permian Basin Pipeline Co.	76	..	Planned	Lea County to Roosevelt County, N. M.
Permian Basin Pipeline Co.	169	..	Planned	Roosevelt County, N. M., to Carson County, Texas.
Pennsylvania Gas Co.	52	12	Under way	Harford Bros.—Between Warren and Erie, Pa.
Peoples Natural Gas Co.	25	..	Proposed	Cambria and Blair counties, Pennsylvania.
Phillips Petroleum Co.	250	2 to 30	Under way	Vaughn & Taylor Const. Co., Inc.—Midland and Glasscock counties, Texas. 10-52.
Phillips Petroleum Co.	200	2 to 30	Planned	Midland, Upton, Glasscock, and Reagan counties, Texas.
Phillips Petroleum Co.	65	4 to 30	Planned	Goldsmith field system, Texas. 1-53.
Phillips Petroleum Co.	28	10	Planned	Bayou plant to Adams terminal. 7-53.
Piedmont Natural Gas Co.	36	8-10-12	Under way	Gragg Const. Co.—West of Greensboro to Burlington, N. C.
Public Service Co. of Colorado	95	..	Planned	Douglas Creek and other gas fields to Grand Junction, Colo., area.
Public Service Co. of North Carolina	83	8	Planned	Kings Mountain to Asheville, N. C. 3-1-53.
Rockland Light & Power Co.	22	8	Planned	Orangetown to Tomkins Cove, N. Y.
South Carolina Natural Gas Co.	160	16-12-10	Planned	Aiken, S. C., to Columbia, Summerville and Charleston, S. C.
Southern California Gas Co. and Southern California Gas Co. of California	87	30	Planned	Whitewater to Desert Center, Calif.
Southern California Gas Co. and Southern California Gas Co. of California	45	30	Planned	Looping on line from Arizona border to Los Angeles.
Southern Natural Gas Co.	169	..	Planned	Ouachita Parish, Louisiana, to Augusta, Ga.
Southern Natural Gas Co.	20	..	Planned	Ouachita Parish, Louisiana.
Southern Natural Gas Co.	33	..	Planned	Ouachita and West Carroll parishes.
Southern Natural Gas Co.	108	14	Planned	Bass Junction to Augusta, Ga.
Southern Natural Gas Co.	1,255	24-4	Planned	Looping in Louisiana, Mississippi, Alabama, and Georgia.
Southern Natural Gas Co.	67	24	Planned	Franklinton, La., to Gwinville, Miss., looping.
Southern Natural Gas Co.	235	24	Planned	Pickens, Miss., to Lincoln, Ala., looping.
Southern Natural Gas Co.	58	16	Planned	Gwinville to Pickens, Miss., looping.
Southern Natural Gas Co.	212	16-18	Planned	Loops.
Southern Natural Gas Co.	130	16	Planned	Macon to Augusta, Ga., to Aiken, S. C.
Southern Natural Gas Co.	120	14	Planned	Savannah, Ga.
Southern Natural Gas Co.	21	24	Planned	Perryville Sta. to Boeuf River, La.
Southern Natural Gas Co.	14	24	Planned	Onward Sta., Mississippi, to Big Sunflower River.

PHILADELPHIA SPIRAL-BEVEL COOLING TOWER DRIVE



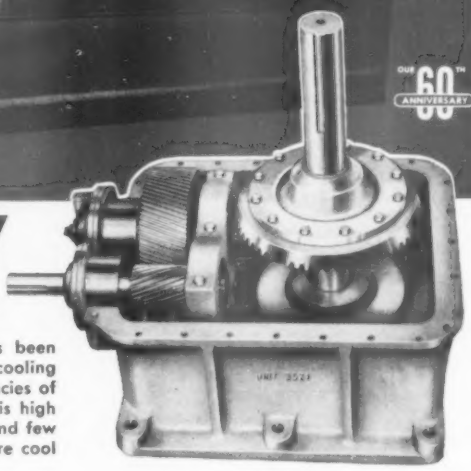
HIGH EFFICIENCY

CUTS POWER LOSS

The Philadelphia Spiral-Bevel Cooling Tower Drive has been developed to transmit the heavier fan loads of today's cooling towers. Many of these units are now operating at efficiencies of 97-98% under the most severe operating conditions. This high efficiency means minimum power loss, less maintenance and few oil changes during the long life of the reducers. Units are cool operating.

A wide range of sizes are available for every cooling tower application.

The drive shown above is on a cooling tower designed and built by Hudson Engineering Company. It is typical of many such installations.



Construction features of the Philadelphia Spiral-Bevel Cooling Tower Drive are given in Bulletin CT-51. Write on your business letterhead for a copy.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

TABLE 3—PRINCIPAL DOMESTIC NATURAL GAS PIPE-LINE PROJECTS PLANNED AND UNDER WAY (Continued)

Company—	Miles	Inch	Status	Contractor, location, and completion date
Southern Natural Gas Co.	14	14	Planned	Perryville Sta., La., to Wilhite Gate.
Southern Union Gas Co.	21	20	Planned	Albuquerque, N. M.
Southern Union Gas Co.	27	10	Planned	Lea and Eddy counties, New Mexico.
Southern Union Gas Co.	30	12-20	Contracted	R. H. Fulton & Co.—San Juan County, N. M.
Southwest Gas Corp., Ltd.	26	..	Planned	From Pacific Gas Elec. line to Victorville, Calif.
Tennessee Gas Transmission Co.	591	24-30	Planned	Looping along present system (consisting of 323 miles of 30-in.; 167 miles of 26-in.; 101 miles of 24-in.)
Tennessee Gas Transmission Co.	101	26	Planned	Kentucky and Ohio.
Tennessee Gas Transmission Co.	304	24	Planned	Mercer, Pa., to Utica, N. Y.
Tennessee Gas Transmission Co.	250	..	.....	Miscellaneous laterals.
Tennessee Gas Transmission Co.	80	26	Contracted	H. C. Price Co.—Harrison County to Jackson County, Ohio.
Tennessee Gas Transmission Co.	24	26	Contracted	H. C. Price—(Spread 1) Carrollton, Ohio, southwestward to Harrison County.
Tennessee Gas Transmission Co.	56	26	Contracted	H. C. Price Co.—(Spread 2) Athens, Ohio, to Jackson County, Ohio.
Tennessee Gas Transmission Co.	202	20-26-30	Planned	Buffalo, N. Y., to Canada.
Tennessee Gas Transmission Co.	44	30	Proposed	Looping in New York.
Tennessee Gas Transmission Co.	63	26	Planned	Loops.
Tennessee Gas Transmission Co.	45	30	Planned	Buffalo to near Niagara Falls, N. Y.
Tennessee Gas Transmission Co.	50	..	Planned	Miscellaneous lateral lines.
Tennessee Gas Transmission Co.	116	30	Under way	Three loops from Refugio to Cleveland, Tex.
Tennessee Gas Transmission Co.	126	30	Under way	Houston Contracting—Arkansas, Louisiana and East Texas.
Tennessee Gas Transmission Co.	43	30	Under way	Houston Contracting—Gallion, La.
Tennessee Gas Transmission Co.	45	10	Under way	Houston Contracting—Eros to Coldwater, La.
Tennessee Gas Transmission Co.	39	30	Under way	Houston Contracting—Sabine River south to Jasper compressor station.
Texas Eastern Transmission Corp.	791	30	Under way	Kosciusko, Miss., to Connellsville, Pa.
Texas Eastern Transmission Corp.	315	24	Planned	Mahoney Const.—Provident City, Tex., to Castor, La.
Texas Eastern Transmission Corp.	217	30	Under way	Anderson Bros. (Sections 8, 9, 10)—Portsmouth, Ohio, to point near Connellsville, Pa.
Texas Eastern Transmission Corp.	77	30	Under way	Anderson Bros. (Spread 8)—Portsmouth to Amesville, Ohio.
Texas Eastern Transmission Corp.	74	30	Under way	Anderson Bros. (Spread 9)—Amesville to Ohio-West Virginia river crossing.
Texas Eastern Transmission Corp.	66	30	Under way	Anderson Bros. (Spread 10)—Ohio River to Connellsville, Pa.
Texas Eastern Transmission Corp.	..	30	Under way	H. C. Price Co.—Wheeling, W. Va.
Texas Gas Transmission Corp.	408	26	Planned	Looping from Bastrop, La., to Hardinsburg, Ky.
Texas Gas Transmission Corp.	47	26	Planned	Northeastward from Covington, Ky.
Texas Gas Transmission Corp.	361	26	Under way	H. C. Price Co.—Mississippi River near Greenville, Miss., to Jeffersontown Station, Ky. 11-15-52.
Texas Gas Transmission Corp.	49	26	Planned	Northeastward from Kenton, Tenn.
Texas Gas Transmission Corp.	45	26	Planned	Northeastward from Calvert City, Ky.
Texas Gas Transmission Corp.	25	26	Planned	Northeastward from Slaughters, Ky.
Texas Gas Transmission Corp.	19	26	Planned	Southwestward from Jeffersontown, Ky.
Texas Gas Transmission Corp.	46	26	Under way	Bastrop, La., to north of Mississippi River.
Texas Gas Transmission Corp.	33	12	Planned	Slaughters, Ky., to Evansville, Ind.
Texas Gas Transmission Corp.	189	26	Planned	Acadia Parish to connection with existing facilities in Morehouse Parish, Louisiana.
Texas-Ohio Gas Co.	1,350	30	Planned	Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va. 6-30-53.
United Fuel Gas Co.	32	20	Under way	H. L. Gentry Const. Co.—Lanham to Broad Run, W. Va.
United Gas Pipe Line Co.	315	24-30	Contracted	Oklahoma Contracting Co.—Agua Dulce to point near Goodrich, Tex.
United Gas Pipe Line Co.	53	24	Planned	Texas.
United Gas Pipe Line Co.	70	30	Under way	Oklahoma Pipe Line Constructor—Houston to south bank of Trinity River.
United Gas Pipe Line Co.	51	30	Under way	River Const. Corp.—(Spread 1). From Pearl River north and south of Jackson, Miss.
United Gas Pipe Line Co.	45	30	Under way	River Const. Corp.—(Spread 2). McComb to Pearl River south of Jackson, Miss.
United Gas Pipe Line Co.	30	30	Under way	River Const. Corp.—(Spread 3). Kosciusko south toward Jackson, Miss.
United Gas Pipe Line Co.	29	12	Under way	River Const. Corp.—(Spread 4) Lafayette to Jeanerette, La.
United Gas Pipe Line Co.	124	..	.....	Sterlington comp. sta. near Monroe, La., to Jackson comp. sta., Miss.
United Gas Pipe Line Co.	23	8-12-16	.....	South Louisiana facilities.
United Gas Pipe Line Co.	36	..	Planned	Offshore from Ingleside to near Refugio, Tex.
Virginia Natural Gas Co.	153	..	.....	Buckingham to Richmond and Portsmouth, Va.
Western Kentucky Gas Co.	....	2 to 4	Under way	Modern Welding Co.—Additions to present system.
Wilcox Trend Pipe Line Co. (Harry Bass Drilling Co.)	157	up to 20	Planned	Gathering system for delivery to proposed Texas Eastern terminal at Provident City, Tex.

TABLE 4—PRINCIPAL FOREIGN CRUDE-OIL PIPE-LINE PROJECTS PLANNED AND UNDER WAY

Company—	Miles	Inch	Status	Contractor, location, and completion date
Cia. de Petroleo Ganso Azul, Ltd.	48	4	Planned	Ganso Azul field to Pucalipa on Upper Ucayali River, Peru.
Condor	90	12	Under way	"Montubi"—Genoa to Rho, near Milan, Italy. 9-1-52.
Creole Petroleum Corp.	143	26	Planned	Williams Bros. and Anderson Bros.—Ule (State of Zulia) to Amuay (State of Falcon) 3-53.
Creole Petroleum Corp.	25	34	Planned	Williams Bros. and Anderson Bros.—Lagunillas to La Salina (State of Zulia) April 1953.
Direccion General de Yacimientos Petroliferos Fiscales	409	...	Under way	Plaza Huincul-Bahia Blanca, Argentina.
Interprovincial Pipe Line Co.	100	16	Contracted	Anderson International Contractors, Ltd.—Regina, Sask., to Gretna, Man.
Interprovincial Pipe Line Co.	32	16	Under way	Anderson International Contractors, Ltd.—Kendal to Peebles, Sask. 9-15-52.
Interprovincial Pipe Line Co.	67	16	Under way	Anderson International Contractors, Ltd.—Carroll, Manitoba, to Somerset, Man., Canada.
Iraq Government	135	12	Planned	M. W. Kellogg Co.—From Iraq Petroleum Co. at Baiji to Baghdad, Iraq.
Middle East Pipeline, Ltd.	800	34-36	Planned	Iran-Levantine Port.
Petroleos Mexicanos	145	13	Considered	Reynosa to Monterrey, Mexico.
Petroleos Mexicanos	100	...	Planned	Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.
Texas Petroleum Co.	60	4 and 6	Under way	Pto. Nino to La Dorada.
Trans-Mountain Oil Pipeline Co.	711	24	Under way	Edmonton, Alta., via Yellowhead Pass to Vancouver, B. C.
Trans-Mountain Oil Pipeline Co.	221	24	Under way	Mannix, Ltd.—Center section of line.
Trans-Mountain Oil Pipeline Co.	472	24	Under way	Comstock Midwestern, Ltd.—Western section of line.
Trans-Mountain Oil Pipeline Co.	238	24	Under way	Comstock Midwestern, Ltd. (Spread 1)—Acheson to Lake Yellowhead.
Trans-Mountain Oil Pipeline Co.	109	...	Under way	Comstock Midwestern, Ltd. (Spread 2)—Lake Yellowhead to Blue River.
Trans-Mountain Oil Pipeline Co.	120	...	Under way	Comstock Midwestern, Ltd. (Spread 3)—Coquihalla Canyon to Burnaby.

TABLE 5—PRINCIPAL FOREIGN PRODUCTS PIPE LINES PLANNED AND UNDER WAY

Colombian Ministry of Petroleum	90	6	Planned	Puerto Berrio-La Dorada, Colombia.
Colombian Ministry of Petroleum	113	6	Contracted	Carolina Construction Co.—Puerto Berrio to Acededo near Medellin, Colombia.
Colombian Ministry of Petroleum	75	4	Planned	Buena Ventura to Cali, Colombia.
Empresa de Ferrocarriles Ecuatorianos	50	6	Under way	J. A. Jones—Guayaquil to Palmira, Ecuador.
Estrada de Ferro Santos a Jundiai	32	18	Under way	Techint—Santos to Sao Paulo, Brazil.
Governments of Southern Rhodesia and Portuguese East Africa	200	...	Considered	Beira, Portuguese Mozambique to Umtali, Southern Rhodesia.
Imperial Oil, Ltd.	230	10-12	Under way	Comstock Midwestern, Ltd.—Sarnia to London—Hamilton to Toronto.
Petrocongo	225	...	Considered	Ango-Ango to Leopoldville, Belgian Congo.
Societe des Transports Petroliers par Pipe Line	160	10	Under way	Entrepose—Le Havre to Paris, France. 1953.
State of Cundinamarca, Colombia	120	6	Under way	Williams Bros.—Puerto Salgar to Bogota, Colombia.
Trans-Northern Pipe Line Co.	440	...	Under way	Mannix, Ltd., and Williams Bros., Ltd.—Hamilton to Toronto to Montreal, Que., Canada.

TABLE 6—PRINCIPAL FOREIGN NATURAL-GAS PIPE-LINE PROJECTS PLANNED AND UNDER WAY

Azienda Generale Italiana Petroli	110	12-14-16	Planned	Cortemaggiore to Genoa.
Azienda Generale Italiana Petroli	110	...	Planned	Cortemaggiore to Bologna.
Azienda Generale Italiana Petroli	145	14-16	Under way	Cortemaggiore to Torino.
Direccion General del Gas del Estado	310	8	Under way	Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.
Northwest Natural Gas Co.	950	24	Planned	Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.
Petroleos Mexicanos	205	16	Under way	Monterrey to Torreon, Mexico.
Petroleos Mexicanos	260	20	Considered	Monterrey-Tampico-Poza Rica, Mexico.
Petroleos Mexicanos, Mexican Gas Co., and Industrial Gas Co.	600	...	Planned	Reynosa, Tamaulipas, Tampico, Poza Rica, Mexico.
Westcoast Transmission Co., Ltd.	1,110	24	Planned	Ford, Bacon and Davis—Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton and Vancouver to Portland.
Westcoast Transmission Co., Ltd.	280	20	Planned	Ford, Bacon and Davis—Pincher Creek to Montana on to Spokane, Wash.
Westcoast Transmission Co., Ltd.	138	20	Planned	Ford, Bacon and Davis—Sumas to Tacoma, Wash.
Westcoast Transmission Co., Ltd.	139	18	Planned	Ford, Bacon and Davis—Tacoma, Wash., to Portland, Ore.
Western Pipe Lines	833	24	Planned	From southern Alberta, eastward across the Canadian prairies, serving principal towns and cities along the route, to a point near the International Boundary.

TABLE 7—PRINCIPAL DOMESTIC CRUDE LINES COMPLETED

Company—	Miles	Inch	Contractor, location, and completion date
American Petroleum Co.	30	6	J. R. Stewart—Village Mills to Arriola field, Hardin County, Texas. 5-15-52.
Cities Service Pipe Line Co.	19	8	Gragg Const. Co.—Cushing to Guthrie, Okla. 6-1-52.
Cities Service Pipe Line Co.	20	8	Gragg Const. Co.—Coyle to Cushing, Okla. 7-1-52.
Interstate Oil Pipe Line Co.	33	20	Latex of Georgia—Bunkie to Melville, La. 6-52.
Mid-Continent Pipe Line Co.	23	4-2	C. P. Carter Const. Co.—Elmore City to Velma, Okla. 3-1-52.
Service Pipe Line Co.	29	20	Drumright, Okla., to Humboldt, Kans. 4-52.
Service Pipe Line Co.	38	10	Cogdell to Aspermont, Tex.
Service Pipe Line Co.	26	10	Saunders to Denton, N. M. 5-52.
Shell Pipe Line Corp.	24	8	Gohlke to Hallettsville, Tex.
Skelly Oil Co.	38	8	Rumsey Bros.—Lyon to Burrton, Kans. 1-52.
Texas Pipe Line Co.	220	22	Houston Contracting Co.—Houma, La., to Port Arthur, Tex.
Texas Pipe Line Co.	67	22	Houston Contracting Co.—Holmwood, La., west to Port Arthur, Tex.
Texas Pipe Line Co.	67	22	Houston Contracting Co.—Holmwood, La., east to Gueydan, La.
The Toronto Pipe Line Co.	30	4-6	Stuart Pipe Line Const. Co.—Slick Station to Pettus, Tex.

TABLE 8—PRINCIPAL DOMESTIC PRODUCTS PROJECTS COMPLETED

Gulf Refining Co.	78	8	Glaser Const.—Port Arthur to Deer Park. 6-10-52.
Gulf Refining Co.	28	8	Vawter Const., and J. R. Stewart Const.—El Vista to Orange, Tex. 6-1-52.
Gulf Refining Co.	30	6	Barry Const. Co.—Deer Park to Texas City, Tex.
The Ohio Oil Co.	24	8	Conyes Const.—East St. Louis to Wood River, Ill.
Phillips Pipe Line Co.	68	12	Brown-Lite Co.—Wichita to Paola, Kans. 3-52.
Phillips Pipe Line Co.	42	10	Mid-States Const. Co.—Green Ridge to Villa Ridge, Mo. 6-52.
Phillips Pine Line Co.	33	8	Somerville Const. Co.—Kankakee to Crete, Ill.
Phillips Pipe Line Co.	484	8-10-12	Borger, Tex., to Kreutzburg, Ind. 5-52.
Phillips Petroleum Co.	28	12	Sweeny to Freeport, Tex. 3-52.
Phillips Pipe Line Co.	41	10	Smith Contracting Co.—Paola, Kans., to Leeton, Mo. 7-52.
Socony-Vacuum Oil Co.	175	6-8	Ray L. Smith & Son, Inc.—Augusta, Kans., to Kansas City, Mo.
Standard Oil Co. (Indiana)	122	8	Bills and Troth Const. Co.—Neodesha, Kans., to Belton, Mo.

TABLE 9—PRINCIPAL DOMESTIC NATURAL-GAS PROJECTS COMPLETED

Cumberland and Allegheny Gas Co.	46	10	Britton Contracting Co., Inc.—Mountain Lake Park, Md., to Preston County, West Virginia.
Dow Chemical Co.	70	...	Mahoney Contracting Co.—Area of Midland, Saginaw and Bay City, Mich.
Equitable Gas Co.	20	16	Rich & Co.—Carnegie to Finleyville, Pa. 7-52.
Houston Pipe Line Co.	50	24	Brown & Riot—Alvin to Wharton, Tex. 5-15.
Houston Pipe Line Co.	28	18	Brown & Root—Alvin to Texas City, Tex. 2-1-52.
Michigan Gas Storage Co.	57	8 to 22	Mahoney Contracting Co.—Clarkston east to Mt. Clemens. 2-1-52.
Natural Gas Co. of West Virginia	23	8-10	H. L. Gentry Const. Co.—Lisbon to Sebring, Ohio.
New York State Natural Gas Corp.	20	20	Williams-Austin Co. (Spread 3)—Cayuta Gate to Ithaca, N. Y. 6-30-52.
Northern Natural Gas Co.	370	4-26	Gathering lines, Hugoton field.
Northern Natural Gas Co.	217	26	G. G. Griffis Const. Co.—Palmyra, Neb., to Skellyville, Tex.
Northern Natural Gas Co.	181	4 to 12	Reese Bros. Const.—Gathering lines in Hugoton field.
Ohio Fuel Gas Co.	25	20	Sheehan Pipe Line Const. Co.—Xenia, Ohio. 2-1-52.
Oklahoma Natural Gas Co.	26	12	Trojan Const. Co., Inc.—Ringwood to Enid.
Oklahoma Natural Gas Co.	16	12	Trojan Const. Co.—Haskell to Muskogee, Okla.
Prince George's Gas Corp.	20	22	Between Chillum and Rockville, Md.
Public Service Co. of North Carolina	33	10	Brulington to Chapel Hill, N. C. 3-1-52.
Public Service Co. of North Carolina	16	8	Chapel Hill to Raleigh, N. C. 7-1-52.
Public Service Co. of North Carolina	29	4	Statesville to Kannapolis, N. C. 7-1-52.
Texas Eastern Transmission Corp.	163	30	Williams Bros. Davis Co. (Sections 1 and 2)—Kosciusko, Miss., to Florence, Ala.
Texas Eastern Transmission Corp.	76	30	Eastern Pipe Line Contractors (Section 3)—Florence, Ala., to Columbia, Tenn.
Texas Eastern Transmission Corp.	73	30	H. B. Zachry Co. (Section 4)—Columbia, Tenn., to Cumberland River.
Texas Eastern Transmission Corp.	79	30	Oman Const. Co. (Section 5)—Cumberland River to Columbia, Ky.
Texas Eastern Transmission Corp.	82	30	N. A. Saigh Co. (Section 6)—Columbia, Ky., to Boonesboro, Ky.
Texas Eastern Transmission Corp.	100	30	Mahoney Const. (Section 7)—Kentucky River to Ohio River, northeastern Kentucky.
Texas Eastern Transmission Corp.	35	30	Mahoney Contr. Co.—Delmont to Uniontown, Pa.
Texas Eastern Transmission Corp.	50	30	Trojan Const. Co., Inc.—Ohio River to Vanceburg, Ky.
Texas Gas Transmission Corp.	181	26	Houston Contracting Co.—Bastrop to Eunice, La. 1-52.
United Gas Pipe Line Co.	97	20-24-26	River Const. Corp. (Spread 6 and 7)—Houston to Dupont's Sabine River Works, Orange, Tex.
United Natural Gas Co.	20	12	H. L. Gentry Const. Co.—Costello, to Driftwood, Pa. 7-1-52.

TABLE 10—PRINCIPAL FOREIGN CRUDE-OIL LINES COMPLETED

Mene Grande Oil Co.	30	26	Chicago Bridge & Iron Co.—Anaco to Puerto La Cruz.
Mene Grande Oil Co.	32	26	Chicago Bridge & Iron Co.—Anaco to Puerto La Cruz.
Shell Caribbean Petroleum Co.	160	30	Williams Bros.—Palmarejo de Mara to Paraguana Peninsula. 4-52.

Refining Capacity Nearing 7.5 Million Barrels

Survey shows 30 expansion projects scheduled for completion this year and next

by R. B. Tuttle

CRUDE-OIL refining capacity of United States plants is scheduled to step up by more than 150,000 bbl. daily before this year's end, according to The Oil and Gas Journal's midyear survey. Currently, there are about 20 expansion projects involving additional crude-oil capacity under construction. With completion of these projects the nation's operable daily refining capacity will near the 7.5-million-barrel mark.

In addition to the 20 projects which are scheduled to step up crude-oil capacity this year there are around 10 others scheduled for 1953 completion. This group represents approximately 100,000 bbl. daily of crude-oil capacity.

Nearly 700,000 bbl. per day of crude-oil replacement capacity is now being built throughout the country. About 60 per cent of this capacity is scheduled for completion this year. The remainder, 275,000 bbl. daily, is expected to go on stream in 1953.

Currently, there are three new and one reinstalled refinery projects under way. These projects involve capacity ratings totaling 79,500 bbl. daily. Still to be given authorization are five other new refinery projects. Capacity ratings on these add up to 135,000 bbl. per day. Authorizations for them to go ahead are expected before the end of the year. In addition to these new refinery projects are five involving capacity increases to existing plants which total about 60,000 bbl. per day.

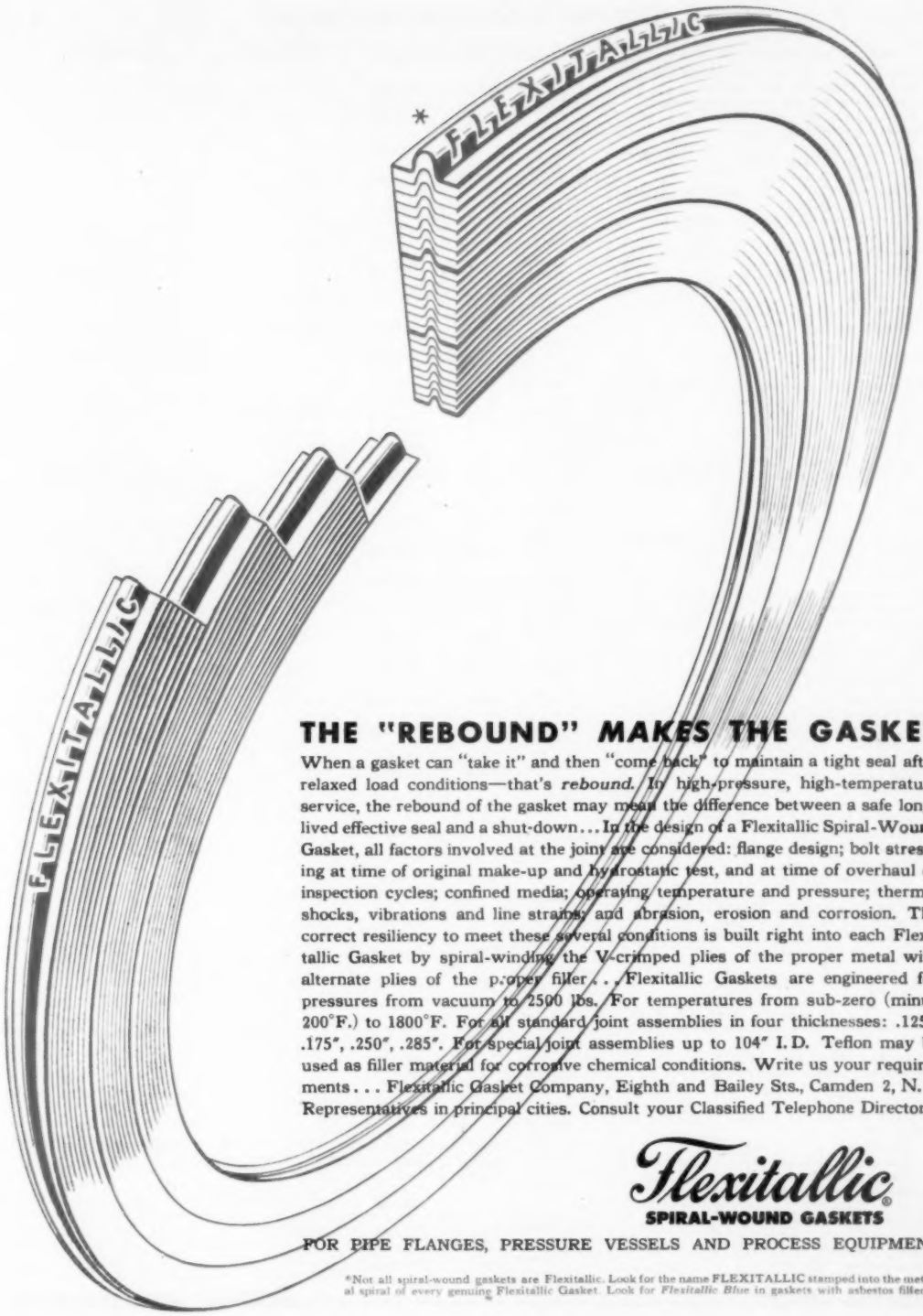
More than 90,000 bbl. of daily catalytic cracking capacity is scheduled to be completed this year. This capacity is made up of 10 different projects and includes one 11,000-bbl. per day cat reformer.

Approximately 220,000 bbl. per day of cat cracking, reforming, and similar facilities is currently under construction for completion in 1953. Construction has not yet started on four other cat cracking projects which are now on authorized status. These four projects involve a total capacity in excess of 30,000 bbl. daily. There are also five projects which have been contracted but not yet started. When completed these projects will add about 35,000 bbl. per day of cat cracking and 15,000 cat reforming capacity.

Approximately 18,500 bbl. daily of cat reforming capacity along with more than 40,000 bbl. per day of cat cracking capacity has been contracted, according to the Journal's current survey. Four different projects make up the cat reforming capacity and a similar number are involved for cat cracking.

Active Refinery-Building Projects

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Aetna Oil Co., Louisville:				
Refinery expansion		Building		
Alamo Chemical Co., Houston:				
Petrochemical plant		Planned		
American Liberty Oil Co., Mount Pleasant, Tex.:				
Cat cracker, bbl. per day	5,000	Planned		
Ashland Oil & Refining Co., Catlettsburg, Ky.:				
Rehabilitate alkylation unit		Authorized		
American Petrochemical Corp., Gulf Coast:				
Petrochemical plant		Proposed		
Atlantic Refining Co., Port Arthur, Tex.:				
Expand chemical plant, lb. per day	180,000	Building	Late '52	E. B. Badger & Sons Co.; H. R. Ferguson
Atlantic Refining Co., Philadelphia:				
Cat reformer, bbl. per day	10,000	Building	Early '53	E. B. Badger & Sons Co.
Expand asphalt plant, bbl. per day	325	Authorized	Early '53	
Crude unit, bbl. per day	45,000	Building	Mid '53	
Cat cracker, bbl. per day	30,000	Building	Mid '52	
Alkylation unit, bbl. per day	3,000	Building	Late '53	
Ammonia plant, tons per day	100	Planned	Mid '53	
Aurora Gasoline Co., Detroit:				
Increase cat cracker, bbl. per day	2,000	Building	1953	
Increase gas-concentration plant		Building		
B. A. Shawinigan, Ltd., Montreal, Que., Canada:				
Phenol plant, lb. per year	13,000,000	Building	Late '52	Canadian Kellogg Co., Ltd.
Bay Petroleum Corp., Denver:				
Cat cracker, bbl. per day	3,000	Building	Early '53	Universal Oil Products Co.; Procon, Inc.
Feed preparation, bbl. per day	2,340	Building		
Revamp poly unit, bbl. per day	220	Building		
Gas-concentration unit		Building		
Ben Franklin Refining Co., Ardmore, Okla.:				
Cat cracker, bbl. per day	6,500	Building	1953	
Polymerization unit, bbl. per day	500	Building	1953	
Gas-concentration unit		Building	1953	



THE "REBOUND" *MAKES* THE GASKET

When a gasket can "take it" and then "come back" to maintain a tight seal after relaxed load conditions—that's *rebound.* In high-pressure, high-temperature service, the rebound of the gasket may mean the difference between a safe long-lived effective seal and a shut-down... In the design of a Flexitallic Spiral-Wound Gasket, all factors involved at the joint are considered: flange design; bolt stressing at time of original make-up and hydrostatic test, and at time of overhaul or inspection cycles; confined media; operating temperature and pressure; thermal shocks, vibrations and line strains; and abrasion, erosion and corrosion. The correct resiliency to meet these several conditions is built right into each Flexitallic Gasket by spiral-winding the V-crimped plies of the proper metal with alternate plies of the proper filler... Flexitallic Gaskets are engineered for pressures from vacuum to 2500 lbs. For temperatures from sub-zero (minus 200°F.) to 1800°F. For all standard joint assemblies in four thicknesses: .125", .175", .250", .285". For special joint assemblies up to 104" I. D. Teflon may be used as filler material for corrosive chemical conditions. Write us your requirements... Flexitallic Gasket Company, Eighth and Bailey Sts., Camden 2, N. J. Representatives in principal cities. Consult your Classified Telephone Directory.

Flexitallic®
SPIRAL-WOUND GASKETS
FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Not all spiral-wound gaskets are Flexitallic. Look for the name FLEXITALLIC stamped into the metal spiral of every genuine Flexitallic Gasket. Look for *Flexitallic Blue* in gaskets with asbestos filler.

ACTIVE REFINERY-BUILDING PROJECTS (Continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
British American Oil Co., Ltd., Moose Jaw, Sask., Canada:				
Refinery expansion, bbl. per day	10,000	Building	.....	.....
Cat cracker, cat poly, and coking units	.....	Building	.....	.....
Gas-concentration plant and storage	.....	Building	.....	.....
Caminol Co., Hanford, Calif.:				
Polymerization unit	.....	Planned	1953	.....
Carter Oil Co., Billings, Mont.:				
Poly plant, bbl. per day	500	Planned	1953	.....
Cities Service Oil Co. (Del.), East Chicago, Ind.:				
Refinery expansion	.....	Planned	.....	.....
Cities Service Oil Co. (Pa.), Linden, N. J.:				
Vacuum unit	.....	Planned	1953	.....
Cities Service Refining Corp., Lake Charles, La.:				
Hydroformer, bbl. per day	5,000	Building	.....	.....
Col-Tex Refining Co., Colorado City, Tex.:				
Cat reformer	1,500	Planned	1953	.....
Continental Oil Co., Lake Charles, La.:				
Refinery expansion, bbl. per day	40,000	Building	Early '53	Stone & Webster Engr. Corp.; Badger Process Corp.
Platformer	.....	Building	.....	Universal Oil Products Co.; Procon, Inc.
Cooperative Refinery Assn., Phillipsburg, Kans.:				
Increase crude unit, bbl. per day	4,000	Building	Early '53	.....
Cat cracking unit, bbl. per day	4,000	Building	Early '53	.....
Poly unit	.....	Building	Early '53	.....
Gas-concentration unit	.....	Building	Early '53	.....
Deep Rock Oil Corp., Cushing, Okla.:				
Lube-oil solvent-refining plant, bbl. per day	1,075	Building	Early '53	M. W. Kellogg Co.; Refinery Engineering Co.
Delta Refining Co., Memphis:				
Cat cracker, bbl. per day	3,000	Building	.....	Koch Engineering Co.
Dominion Tar & Chemical Co., Ltd., Canada:				
Petrochemical plant, lb. per day	40,000	Building	.....	.....
Dow Chemical Co., Freeport, Tex.:				
Petrochemical plant	.....	Building	.....	.....
Dow Chemical Co., Midland, Mich.:				
Toluene plant	.....	Building	.....	Stone & Webster Engr. Corp.
Eldorado Refining Co., El Dorado, Kans.:				
Refinery expansion, bbl. per day	6,000	Building	.....	Refinery Engineering Co.
Elk Refining Co., Falling Rock, W. Va.:				
Platformer, bbl. per day	1,500	Building	.....	Universal Oil Products Co.
Esso Standard Oil Co., Bayonne, N. J.:				
Atmospheric unit, bbl. per day	28,500	Building	Late '52	Lummus Co.
Esso Standard Oil Co., Everett, Mass.:				
Cat cracker, bbl. per day	18,500	Building	1953	Foster Wheeler Corp.
Esso Standard Oil Co., Baton Rouge:				
Increase crude-oil capacity, bbl. per day	60,000	Building	1953	M. W. Kellogg Co.
Expand cat cracker	25,000	Building	1953	.....
Esso Standard Oil Co., Virginia or North Carolina:				
New refinery, bbl. per day	50,000	Planned	.....	.....
E. I. duPont de Nemours & Co., Inc., Beaumont, Tex.:				
Petrochemical plant	.....	Planned	.....	.....
Famariss Oil & Ref. Co., Hobbs, N. M.:				
New refinery—				
Crude unit, bbl. per day	5,000	Planned	.....	.....
Platformer	.....	Planned	.....	.....
Famariss Oil & Ref. Co., Monument, N. M.:				
Moving and modifying refinery	.....	Building	.....	.....
Farmers Union Central Exchange, Inc., Laurel, Mont.:				
Cat cracker, bbl. per day	5,000	Building	Mid '52	Universal Oil Products Co.; Refinery Engineering Co.
Poly unit, bbl. per day	300	Building	Mid '52	Universal Oil Products Co.; Refinery Engineering Co.
Frontier Oil Refining Corp., Tonawanda, N. Y.:				
Expand crude-oil capacity, bbl. per day	6,000	Building	1953	.....
Cat cracker, bbl. per day	7,500	Building	1953	.....
Gas-concentration unit	.....	Building	.....	.....
Additional polymer capacity	.....	Building	.....	.....
Vacuum-distillation unit	.....	Building	.....	.....
Asphalt facilities	.....	Building	.....	.....
Fulton & Olmstead, San Antonio:				
New refinery—				
Crude unit, bbl. per day	10,000	Authorized	1953	Koch Engineering Co.
Cat cracker, bbl. per day	4,650	Authorized	1953	Universal Oil Products Co.
Platformer, bbl. per day	1,640	Authorized	1953	.....
General Petroleum Corp., Torrance, Calif.:				
Cat cracker	.....	Planned	.....	.....
Gilcrease Oil Co., Meraux, La.:				
Cat cracking unit, bbl. per day	3,000	Planned	1953	.....
Gilmore Refineries, Inc., Odessa, Tex.:				
New refinery, bbl. per day	50,000	Planned	.....	.....

ACTIVE REFINERY-BUILDING PROJECTS (Continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Globe O. & R. Co., Lemont, Ill.:				
Increase crude-oil capacity, bbl. per day	10,000	Building	.....	.....
Increase cat cracking, bbl. per day	2,000	Building	.....	.....
Increase desulfurization unit, bbl. per day	5,000	Building	.....	.....
New alkylation unit, bbl. per day	1,500	Building	.....	.....
Great Northern Oil Co., St. Paul:				
Crude unit, bbl. per day	30,000	Authorized	.....	.....
Cat cracker, bbl. per day	7,500	Authorized	.....	.....
Alkylation unit, bbl. per day	2,500	Authorized	.....	.....
Cat reformer, bbl. per day	6,000	Authorized	.....	.....
Cat poly unit, bbl. per day	700	Authorized	.....	.....
Gulf Oil Corp., Philadelphia:				
Cat cracker, bbl. per day	63,000	Building	Mid '53	M. W. Kellogg Co.
Distillation unit, bbl. per day	125,000	Building	Late '52	Foster Wheeler Corp.
Cat reformer, bbl. per day	10,000	Planned	Mid '53	.....
Gasoline sweetening unit, bbl. per day	40,000	Building	Mid '53	.....
Gulf Oil Corp., Cincinnati:				
Packaging and blending plant	.....	Planned	.....	.....
Gulf Oil Corp., Port Arthur, Tex.:				
Sulfur plant, tons per day	* 60	Contracted	Late '52	Ralph M. Parsons Co.
Isooctyl alcohol facilities	.....	Building	Late '52	.....
Ethylene plant, tons per day	250	Building	Mid '52	Lummus Co.
Sludge decomposition acid unit, bbl. per day	300	Planned	Late '52	.....
Hercules Powder Co., Gibbstown, N. J.:				
Petrochemical plant	.....	Authorized	.....	.....
Heyden Chemical Corp., Houston:				
Methanol plant	.....	Authorized	.....	.....
Humble Oil & Refining Co., Baytown, Tex.:				
Petrochemical plant, lb. per month	2,000,000	Building	1953	C. F. Braun Const. Co.
Imperial Oil, Ltd., Vancouver, B. C.:				
Expand refinery crude cap., bbl. per day	10,500	Planned	.....	.....
Cat cracking unit, bbl. per day	7,600	Planned	.....	.....
International Refineries, Inc., Wrenshall, Minn.:				
New refinery, bbl. per day	11,500	Building	Late '52	Lummus Co.
Cat cracker	.....	.....	.....	.....
Jefferson Chemical Co., Port Neches, Tex.:				
Expand petrochemical plant	.....	Building	Late '52	.....
Kanotex Refining Co., Arkansas City, Kans.:				
Vacuum unit, bbl. per day	5,750	Building	Late '52	Refinery Engineering Co.
Cat cracker, bbl. per day	4,600	Building	Late '52	.....
Kerr-McGee Oil Industries, Wynnewood, Okla.:				
Additions and modifications to plant	.....	Building	.....	.....
Koppers Co., Port Arthur, Tex.:				
Petrochemical plant	.....	Building	.....	.....
Leonard Refineries, Inc., Alma, Mich.:				
Increase crude-oil cap., bbl. per day	10,000	Building	Late '52	.....
Additions to cat cracker, bbl. per day	2,500	Building	Late '52	Catalytic Const. Co.
Enlarge asphalt facilities, bbl. per day	700	Building	1953	.....
Increase L.P.G. capacity, bbl. per day	100	Building	1953	.....
Lion Oil Co., El Dorado, Ark.:				
Cat cracker, bbl. per day	10,000	Contracted	.....	.....
Alkylation unit, bbl. per day	1,000	Contracted	.....	.....
Vapor-recovery unit, bbl. per day	.....	Contracted	.....	.....
McMurrey Refining Co., Tyler, Tex.:				
Cat reformer, bbl. per day	5,000	Building	1953	.....
Contact coker, bbl. per day	1,500	Building	1953	.....
Magnolia Petroleum Co., Beaumont, Tex.:				
Feed-preparation unit	.....	Building	Mid '52	.....
Malco Refineries, Inc., Prewitt, N. M.:				
Expand crude cap., bbl. per day	3,500	Authorized	.....	.....
Cat reformer	.....	Contracted	.....	Grebe & Doremus Process Co.
Cat poly	.....	Authorized	.....	.....
Expand thermal cracker	.....	Authorized	.....	.....
Mercury Oil Refining Co., Oklahoma City:				
Refinery expansion, bbl. per day	7,000	Building	Late '53	Refinery Engineering Co.
Cat cracker	.....	Building	.....	.....
Poly unit	.....	Building	.....	.....
Midland Coop. Wholesale, Cushing, Okla.:				
Cat cracker, bbl. per day	4,000	Building	1953	.....
Vis breaker, bbl. per day	5,000	Building	1953	.....
Cat poly, bbl. per day	300	Building	1953	.....
Gas-concentration unit	.....	Building	1953	.....
Monsanto Chemical Co., Texas City, Tex.:				
Petrochemical plant increase	.....	Building	Late '52	.....
National Coop. Refinery Assn., McPherson, Kans.:				
Cat cracker, bbl. per day	10,000	Building	.....	Refinery Engineering Co.
Cat poly unit, bbl. per day	600	Building	.....	Refinery Engineering Co.
Increase crude unit, bbl. per day	3,000	Building	.....	Refinery Engineering Co.
Revamp vacuum unit	.....	Building	.....	Refinery Engineering Co.
Revamp thermal cracker	.....	Building	.....	Refinery Engineering Co.

"Get Security in Drilling" is our way of saying "get security in *your* drilling" through the use of efficient, dependable equipment. For over 20 years Security Engineering has designed and manufactured subsurface drilling equipment to meet the exacting demands of the oil and gas industry. With a complete line of rock bits, reamers, hole openers, casing scrapers and reamer rock bits, backed by field-tested design and precision manufacturing, Security is meeting today the current requirements of intensified drilling activity. Inspection will show consistently high drilling performance when you use Security products. For this security in drilling, get SECURITY in your drilling.

GET Security IN DRILLING

ONE OF THE DRESSER INDUSTRIES

SECURITY ENGINEERING CO., INC.

Main Office and Plant: Whittier, California
Branches in all major producing areas
Export Office: Chanin Building, New York City

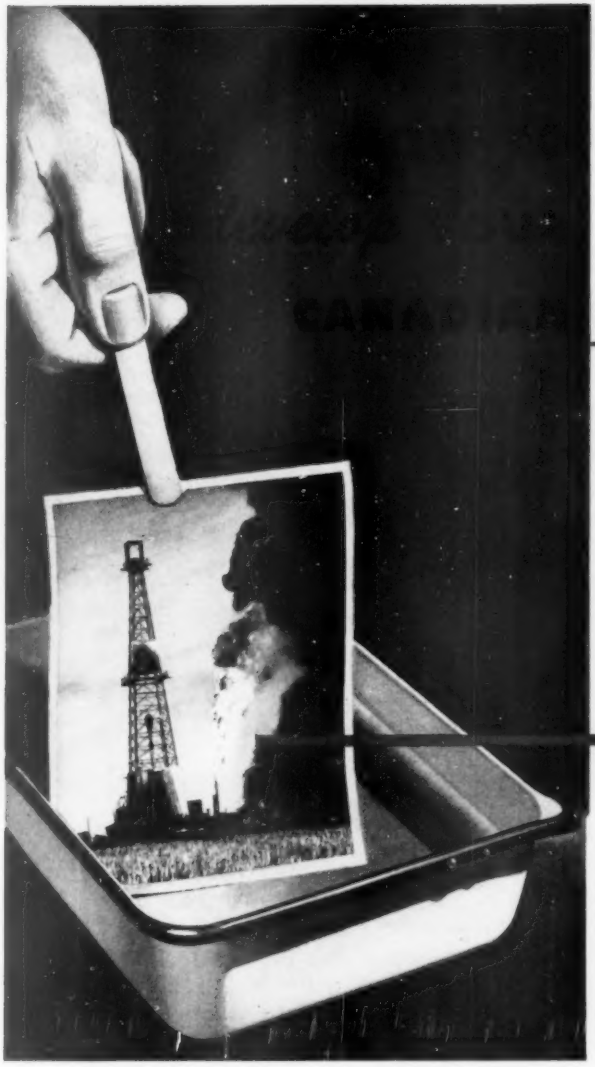
ROCK BITS • REAMERS • HOLE OPENERS • CASING SCRAPERS • SECURALOY

ACTIVE REFINERY-BUILDING PROJECTS (Continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Northwestern Refining Co., St. Paul Park, Minn.:				
Cat cracker, bbl. per day	5,000	Building	Early '53	Universal Oil Products Co.; Procon, Inc.
Topping unit, bbl. per day	30,000	Authorized	Mid '53	.....
Ohio Oil Co., Robinson, Ill.:				
Coking unit, bbl. per day	6,000	Building	.....	Lummus Co.
Alkylation unit, bbl. per day	1,500	Planned	.....	.....
Cat reformer, bbl. per day	7,000	Planned	.....	.....
Pan American Refining Corp., Texas City, Tex.:				
Cat cracker, bbl. per day	30,000	Building	1953	Lummus Co.
Cat poly unit, bbl. per day	800	Building	1953	Lummus Co.
Pan-Am Southern Corp., Destrehan, La.:				
Hydroformer, bbl. per day	2,000	Building	.....	M. W. Kellogg Co.
Petco Corp., Marrero, La.:				
Refinery increase, crude unit, bbl. per day	5,000	Building	.....	.....
Cat cracker, bbl. per day	1,000	Building	.....	.....
Phillips Oil Co., Okmulgee, Okla.:				
Cat cracker, bbl. per day	8,000	Building	Mid '52	Fluor Corp., Ltd.
Phillips Petroleum Co., Woods Cross, Utah:				
Cat cracker, bbl. per day	8,000	Building	Late '52	Fluor Corp., Ltd.
Phoenix Refining Co., Inc., San Antonio, Tex.:				
Reinstalling refinery, bbl. per day	3,000	Building	.....	.....
Premier Petroleum Co., Fort Worth:				
Cat cracker, bbl. per day	4,000	Authorized	.....	.....
Pure Oil Co., Smiths Bluff, Tex.:				
Cat cracker	.....	Contracted	Early '53	M. W. Kellogg Co.
Cat poly unit	.....	Contracted	Early '53	M. W. Kellogg Co.
Expand alkylation unit	.....	Contracted	Early '53	M. W. Kellogg Co.
Tube still	.....	Contracted	Early '53	.....
Pure Oil Co., Toledo:				
Cat cracker	.....	Contracted	Early '53	M. W. Kellogg Co.
Cat poly unit	.....	Contracted	Early '53	M. W. Kellogg Co.
R. J. Oil & Refining Co., Inc., Princeton, Ind.:				
Platformer, bbl. per day	750	Building	Late '52	Universal Oil Products Co.
Republic Oil Refining Co., Texas City, Tex.:				
Platformer	.....	Building	1953	Universal Oil Products Co.
Plant expansion	.....	Building	1953	Universal Oil Products Co.
Richfield Oil Corp., Watson, Calif.:				
Cat cracker	.....	Planned	.....	.....
Riverlake Oils, Fort William, Ont.:				
New refinery, bbl. per day	4,000	Planned	.....	.....
Roosevelt O. & R. Corp., Mount Pleasant, Mich.:				
Platformer, bbl. per day	1,800	Building	Mid '52	Universal Oil Products Co.; Procon, Inc.
Platreater, bbl. per day	450	Building	Mid '52	Universal Oil Products Co.; Procon, Inc.
Udex unit, bbl. per day	1,200	Building	Mid '52	Universal Oil Products Co.; Procon, Inc.
Salt Lake Refining Co., Salt Lake City:				
Vacuum unit, bbl. per day	9,500	Building	.....	Bechtel Corp.
Shell Chemical Co., Houston:				
Ethyl chloride plant	.....	Building	.....	.....
Sulfur plant, tons per year	13,000	Building	Mid '52	Ralph M. Parsons Co.
Shell Chemical Co., Ventura, Calif.:				
Petrochemical plant, tons per day	150	Building	Mid '53	.....
Shell Oil Co., Wilmington, Calif.:				
New crude unit, bbl. per day	52,000	Building	Late '52	.....
Shell Oil Co. of Canada, Ltd., Montreal, Que., Canada:				
Alcohol plant, tons per year	10,000	Building	.....	C. F. Braun Co.
Shell Oil Co., Norco, La.:				
Refinery expansion, bbl. per day	25,000	Authorized	.....	.....
Cat cracker	.....	Authorized	.....	.....
Shell Oil Co., Wood River, Ill.:				
Expand refinery, bbl. per day	50,000	Building	.....	.....
Sinclair Refining Co., East Chicago, Ind.:				
Vacuum still, bbl. per day	20,000	Building	Mid '52	Arthur G. McKee Co.
Sinclair Refining Co., Wood River, Ill.:				
Sulfur dioxide treater, bbl. per day	10,000	Building	Late '52	Stone & Webster Engr. Corp.
Sinclair Refining Co., Marcus Hook, Pa.:				
Sulfur plant, tons per day	21	Building	Late '52	Ralph M. Parsons Co.
Sinclair Refining Co., Wellsville, N. Y.:				
Propane deasphalting unit	.....	Planned	.....	.....
Sinclair Refining Co., Houston:				
Cat cracker, bbl. per day	50,000	Building	Late '53	C. F. Braun Co.
Topping unit, bbl. per day	35,000	Building	Late '53	Fluor Corp., Ltd.
Vacuum unit	.....	Building	Late '53	.....
Socony-Vacuum Oil Co., Inc.:				
Cat cracker, bbl. per day	15,000	Building	1952	.....
Standard Oil Co. of California, El Segundo, Calif.:				
Platformer, bbl. per day	10,000	Building	.....	Universal Oil Products Co.
Benzene facilities, bbl. per day	850	Building	Mid '52	Fluor Corp., Ltd.
Toluene facilities, bbl. per day	3,200	Building	.....	Fluor Corp., Ltd.

ACTIVE REFINERY-BUILDING PROJECTS (Continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Standard Oil Co. of California, Richmond, Calif.:				
Vacuum unit, bbl. per day	50,000	Building	.....	.....
Isobutane facilities	.....	Building	.....	.....
Expand alkane facilities, bbl. per day	3,000	Contracted	.....	Bechtel Corp.
Standard Oil Co. (Ind.), Sugar Creek, Mo.:				
Expand crude units, bbl. per day	30,000	Building	1952	Lummus Co.
Standard Oil Co. (Ind.), Whiting, Ind.:				
Benzene facilities, bbl. per day	1,070	Building	1952	.....
Sulfur plant, tons per day	50	Building	1952	Fluor Corp.
Standard Oil Co. (Ind.), Wood River, Ill.:				
Alcohol plant, lb. per year	10,000,000	Contracted	1952	M. W. Kellogg Co.
Standard Oil Co. (Ind.), Mandan, N. D.:				
New refinery, bbl. per day	15,000	Planned	.....	.....
Standard Oil Co. (Ohio), Cleveland:				
Crude units, bbl. per day	50,000	Building	Mid '52	Arthur G. McKee Co.
Standard Oil Co. (Ohio), Lima, Ohio:				
Expand cat cracker, bbl. per day	27,000	Building	Mid '52	Arthur G. McKee Co.
Cat reformer, bbl. per day	15,000	Contracted	Early '54	Lummus Co.
Revamp crude coker, bbl. per day	30,000	Contracted	Early '53	Lummus Co.
Standard Oil Co. (Ohio), Toledo:				
Alkylation unit, bbl. per day	3,000	Planned	1953	.....
Standard Oil Co. of Texas, El Paso, Tex.:				
Cat unit, bbl. per day	10,400	Building	Mid '52	Catalytic Construction Co.; Houdry Process Corp.; M. W. Kellogg Co.
Vacuum unit, bbl. per day	5,200	Building	Mid '52	.....
Alkylation unit, bbl. per day	940	Building	Mid '52	.....
Vapor-recovery plant	.....	Building	Mid '52	.....
Stanolind Oil & Gas Co., Superior, La.:				
Hydroforming plant	.....	Considered	1953	.....
Sun Oil Co., Marcus Hook, Pa.:				
Houdriformer, bbl. per day	11,000	Building	Late '52	.....
Arosorb unit	.....	Building	.....	.....
Sun Oil Co., Sarnia, Ont., Canada:				
New refinery, bbl. per day	15,000	Building	.....	.....
Suntide Oil Corp., Corpus Christi, Tex.:				
New refinery, bbl. per day	25,000	Contracted	Late '53	Lummus Co.
Sunray Oil Corp., Duncan, Okla.:				
Rehabilitate alky unit, bbl. per day	2,100	Contracted	Mid '52	Refinery Engineering Co.
Taylor O. & G. Co., Corpus Christi, Tex.:				
Aromatics facilities, bbl. per day	1,200	Planned	.....	.....
Taylor O. & G. Co., Port Isabel, Tex.:				
Propane and L.P.G. recovery facilities, bbl. per day	600	Planned	.....	.....
Texas City Refining, Inc., Texas City, Tex.:				
Houdriflow unit, bbl. per day	18,000	Contracted	.....	.....
The Texas Co., Westville, N. J.:				
Desalting unit, bbl. per day	60,000	Planned	Early '53	.....
The Texas Co., Lockport, Ill.:				
Increase refinery capacity—				
Atmospheric-vacuum unit, bbl. per day	25,000	Planned	Early '54	.....
Furfural refining unit	.....	Planned	Early '54	.....
Solvent-dewaxing unit	.....	Planned	Early '54	.....
Contact filter plant	.....	Planned	Early '54	.....
Propane deasphalting unit	.....	Planned	Early '54	.....
Percolation filter unit	.....	Planned	Early '54	.....
Compounding and packaging	.....	Planned	Early '54	.....
The Texas Co., El Paso, Tex.:				
Crude-oil unit, bbl. per day	4,000	Building	1953	.....
Cat cracker, bbl. per day	5,000	Building	1953	.....
The Texas Co., Amarillo, Tex.:				
Crude-oil unit, bbl. per day	6,500	Building	1953	.....
Cat cracker, bbl. per day	5,000	Building	1953	.....
Alkylation unit, bbl. per day	500	Building	1953	.....
Tide Water Associated Oil Co., Drumright, Okla.:				
Crude unit, bbl. per day	4,000	Contracted	Late '52	Born Engineering Co.
Union Oil Co. of California, Wilmington, Calif.:				
Crude units, bbl. per day	40,000	Building	Late '52	Fluor Corp.
Addition to boiler plant and revision to steam system	.....	Building	Late '52	C. C. Moore & Co.
Acid treater and rerun column, bbl. per day	15,000	Building	Late '52	C. F. Braun Co.
Sulfur plant, tons per day	50	Building	Late '52	Ralph M. Parsons Co.
Ammonium sulfate plant, tons per day	50	Building	Early '53	Ehrhart & Arthur
Union Oil Co. of California, Rodeo, Calif.:				
Modernized asphalt plant, tons per day	780	Building	Late '53	Ehrhart & Arthur
Vickers Petroleum Co., Inc., Potwin, Kans.:				
Increase refinery, bbl. per day	4,000	Building	1953	.....
Cat cracker	.....	Building	Mid '53	Southwest Engineering Co.
Wilcox Oil Co., Bristow, Okla.:				
Platformer, bbl. per day	1,500	Building	Mid '52	Universal Oil Products Co.; Procon, Inc.
Wood River Oil & Refining Co., Calumet City, Ill.:				
New refinery, bbl. per day	15,000	Planned	.....	.....
Cat cracker, bbl. per day	6,800	Planned	.....	.....



oil operation

From planning to financing, you can speed the development of your operation in Canada's rich oil lands by using the knowledge, experience and facilities of Canada's First Bank. Dotting the oil Provinces with 129 branches, the B of M offers you on-the-scene "know-how" combined with experienced understanding of the requirements of U.S. oil men operating in Canada.

For a clear picture of...

Canadian Company Formation
Exploration Regulations
Reservations of Oil and Gas Rights
Lease Terms and Royalties
Taxation and Exchange
. . . call on the B of M

FOR A PROMPT RESPONSE to your inquiry, contact Gordon V. Adams, Special Representative, Bank of Montreal, Calgary Main Office, 140 Eighth Avenue West, Calgary, Alberta, Canada. (Telephone 2-8333).

NO STOCK RECOMMENDATIONS

While the Bank is prepared to provide all available information on the oil industry, it does not make recommendations regarding the purchase of individual oil stocks.

"MY BANK" TO A MILLION CANADIANS

B of M

BANK OF MONTREAL

Canada's First Bank Coast-to-Coast

In Canada since 1817 • *In U. S. since 1859*

New York . . . 64 Wall Street • Chicago . . . 27 S. LaSalle Street • San Francisco . . . 333 California Street

Head Office: Montreal

570 BRANCHES ACROSS CANADA • RESOURCES EXCEED $2 BILLION

Nation Has 24 Processing Plants Building, Planned

Total natural-gasoline-plant capacity estimated at approximately 27 million gallons

by R. B. Tuttle

AT this midyear period, The Oil and Gas Journal's survey shows 11 new natural-gasoline plants and 1 new cycling plant are currently under construction. In addition to this, the survey reveals 12 new gasoline plants are still in the planning stage. The survey also shows a large number of plant-expansion projects in various stages of development, including natural-gas processing installations and facilities for petrochemical operations.

Combined liquids-production capacity of the different natural-gasoline-plant projects is estimated to boost the total United States capacity rating well toward 27 million gallons per day. Texas shares the greater portion of this capacity increase, placing that state still further ahead of all others in field processing.

A substantial stepup in total United States plant capacity is expected to result with completion of the 22 natural-gasoline-plant expansion projects now under way in various sections of the country. A further boost is pending. This additional capacity involves 12 projects which are in the planning stage. Authorization of these projects is expected before the year's end.

Currently there are nine sulfur-conversion plants in various stages of completion with two projects still in the planning stage. Of the eight petrochemical plants reported in the Journal's survey, four are yet to be started.

Before the end of 1952 additional projects, which are yet to be announced, are expected to contribute sizable increases to current field processing-plant capacities. In this group are both petrochemical and natural-gasoline plants.

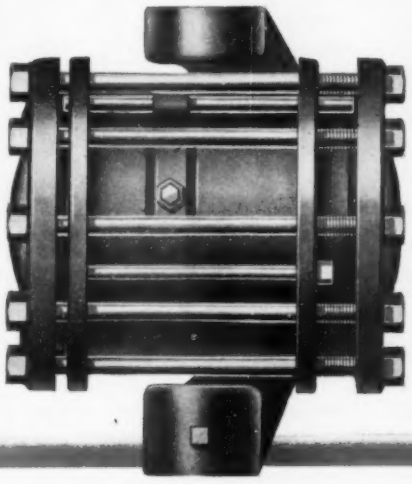
NATURAL-GAS PROCESSING-PLANT BUILDING PROJECTS

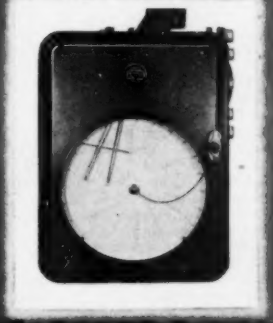
Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Amarillo Oil Co., Amarillo, Tex.:				
Move gasoline plant	.....	Building	1952	.....
American Cyanamid Co., Jefferson Parish, La.:				
Petrochemical plant	.....	Contracted	.....	Chemical Const. Corp.; I. A. Jones Const. Co.
American Republics Corp., Hardin County, Texas:				
Remote absorber, cu. ft. per day	30,000,000	Building	1952	.....
Anchor Gasoline Corp., North Tepetate, La.:				
New gasoline plant, gal. per day	15,000	Building	Mid '52	.....
Arkansas Fuel Oil Co., Haughton, La.:				
Plant increase, cu. ft. per day	60,000,000	Building	Late '52	.....
Arkansas Fuel Oil Co., Heflin, La.:				
Plant increase, cu. ft. per day	60,000,000	Building	Late '52	.....
Arkansas Fuel Oil Co., Magnolia, Ark.:				
Increase propane recovery, cu. ft. per day	100,000,000	Building	Late '52	.....
Atlantic Refining Co., Crane County, Texas:				
Increase plant capacity	100,000,000	Building	Late '52	.....
Bennett Oil & Refining Co., Refugio, Tex.:				
Increase compressor capacity, cu. ft. per day	2,500,000	Planned	1952	.....
J. R. Butler Interests, Howard County, Texas:				
New natural-gasoline plant	.....	Planned	.....	.....
Cabot Carbon of Canada, Ltd., Sarnia, Ont.:				
Carbon-black plant	.....	Building	1953	.....
Campbell Absorption Plant, Ltd., Alberta, Canada:				
New natural-gasoline plant	.....	Planned	.....	.....
Carbide & Carbon Chemicals Div., Texas City, Tex.:				
Petrochemical plant	.....	Planned	.....	.....
Central Petroleum Co., Coyle, Okla.:				
New gasoline plant	.....	Authorized	.....	.....
Cities Service Oil Co. (Del.), Blackwell, Okla.:				
New natural-gasoline plant, gal. per day	200,000	Authorized	.....	.....
Colorado Interstate Gas Co., Dumas, Tex.:				
New gasoline plant	.....	Planned	.....	.....
Continental Oil Co., Johnson County, Wyoming:				
New gasoline and repressure plant, gal. per day	2,000	Authorized	.....	.....
Del Rey Petroleum Co., Eagle Lake, Tex.:				
Plant increase, cu. ft. per day	40,000,000	Building	1952	O. L. Olson Co.
Delta Chemical Co., Pointe a la Hache, La.:				
Petrochemical plant	.....	Planned	.....	.....
El Paso Natural Gas Co., Lea County, New Mexico:				
Purification and dehydration plant, cu. ft. per day	80,000,000	Building	1952	Fluor Corp.
New gasoline plant, cu. ft. per day	85,000,000	Building	1952	.....
New gasoline plant, gal. per day	142,000	Planned	1952	.....
El Paso Natural Gas Co., San Juan County, New Mexico:				
New gasoline plant, gal. per day	192,000	Planned	1952	.....
El Paso Natural Gas Co., Midland County, Texas:				
Purification and dehydration plant, cu. ft. per day	10,000,000	Building	1952	.....

Now AMERICAN® offers...

THE *NEW* MERCURYLESS DRI-FLO ORIFICE METERS

Easy to Install · Lastingly Accurate · Minimum Maintenance





Dri-Flo Orifice Meters provide the precision accuracy, dependability and low maintenance long noted in American Westcott Orifice Meters, available for applications where mercury manometers are undesirable. For working pressures to 1000 P.S.I., ambient temperatures of —25° to 175°F.

- ONE PIECE STAINLESS STEEL BELLOWS—minimizes metal fatigue for long service life.
- DIRECT FULL SCALE RECORDING PEN MOVEMENT—no external gearing or linkage multiplication.
- STAINLESS STEEL INTERNAL PARTS—and Monel metal stuffing box shaft for corrosion resistance.
- AMERICAN TYPE "B" TEFLON SEAL STUFFING BOX—no lubrication, no shaft freezing, no leaks.
- STICK PROOF CHECK VALVES—protect bellows against over-range damage or distortion.
- SIMPLIFIED RANGE CHANGE—no disconnecting manifolds.
- EASY CALIBRATION AND CLEANING—by simply removing one or both case cover heads.

NO PRECISE LEVELLING OR SEAL POTS REQUIRED.

FOR PEDESTAL, PANEL OR OVERHEAD MOUNTING—TOP OR BOTTOM GAUGE LINE CONNECTIONS.

Dri-Flo Meters are the latest addition to the American line—developed under the Company's century-old tradition of "Sustained Accuracy at Lower Cost."

Write for Specifications

AMERICAN METER COMPANY
INCORPORATED ESTABLISHED 1836

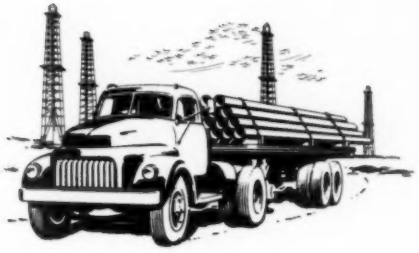
AMERICAN METER CO. EST. 1836 MEASUREMENT ENGINEERS

GENERAL SALES OFFICE:
1513 Race Street, Philadelphia
Albany • Alhambra • Atlanta • Baltimore
Birmingham • Boston • Chicago • Dallas • Denver
Erie • Houston • Kansas City • Los Angeles
Minneapolis • New York • Odessa • Omaha
Pittsburgh • San Francisco • Tulsa • Canadian
Meter Co., Ltd., Hamilton, Ont. • Edmonton, Alb.

NATURAL-GAS PROCESSING-PLANT BUILDING PROJECTS (Continued)

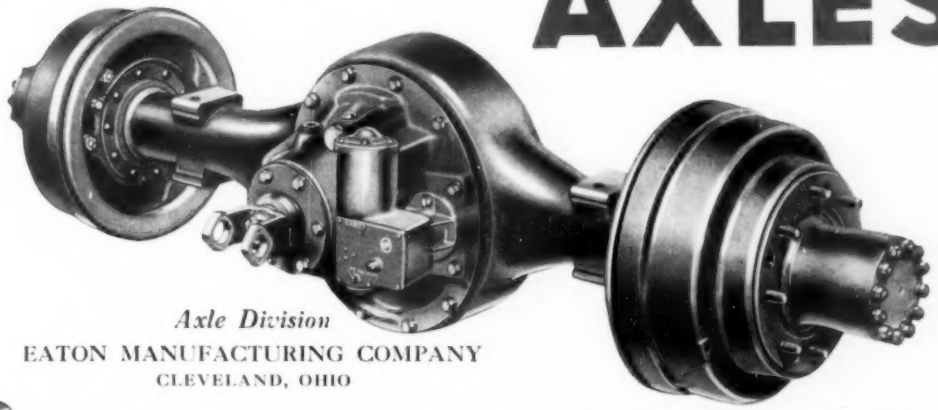
Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
General Chemical Corp., Monument, N. M.:				
Sulfur-conversion plant		Building		
General Crude Oil Co., Kent County, Texas:				
Extraction plant		Planned		
General Petroleum Corp., Manderson field, Wyoming:				
Sulfur plant, tons per day	50	Authorized		
Gulf Oil Corp., Crane County, Texas:				
Sulfur plant, tons per day	20	Building	1952	Graff Engr. & Equip. Co.
Gulf Oil Corp., St. Landry Parish, Louisiana:				
New cycling plant, cu. ft. per day	25,000,000	Building	Mid '53	
Hugoton Production Co., Ulysses, Kans.:				
Increase plant capacity, gal. per day	90,000	Building		
Humble Oil & Refining Co., Hopkins County, Texas:				
Plant expansion		Building	1953	Stearns-Roger Mfg. Co.
Imperial Sulfur & Acid Co., San Juan basin, New Mexico:				
Sulfur plant, tons per day	60	Planned		
Jergins Oil Co. of Texas, Dewitt, Tex.:				
Compressor-stripper plant		Authorized		
Lion Oil Co., Emory, Tex.:				
Sulfur plant		Building		
Lion Oil Co., Luling, La.:				
Petrochemical plant, tons daily	300	Planned		
Lone Star Gas Co., Parker County, Texas:				
New natural-gasoline plant, gal. per day	25,000	Planned	1952	
Lone Star Producing Co., Upton County, Texas:				
New natural-gasoline plant		Planned		
Lone Star Producing Co., Runnels County, Texas:				
New natural-gasoline plant, cu. ft. per day	30,000,000	Building		Gasoline Plant Const. Co.
Magnolia Petroleum Co., Pegasus field, Texas:				
New gasoline plant, cu. ft. per day	30,000,000	Building	Late '52	Hudson Engineering Corp.
Magnolia Petroleum Co., Longville, La.:				
New gasoline plant, cu. ft. per day	3,100,000	Building	Mid '52	Blaw-Knox Construction Co.
Magnolia Petroleum Co., Clayton field, Texas:				
Separation and dehydration, cu. ft. per day	47,500,000	Building	Mid '52	Delta Engineering Corp.
Monsanto Chemical Co., Texas City, Tex.:				
Petrochemical plant		Building		
National Petro-Chemicals Corp., Tuscola, Ill.:				
Alcohol plant		Building		
Northern Natural Gas Co., Holcomb, Kans.:				
Dew-point-control plant		Building	1952	
Ohio Oil Co., Bay City, Tex.:				
Natural-gas processing plant, cu. ft. per day	91,000,000	Building	1952	Hudson Engineering Corp.
Panoma Corp., Carson County, Texas:				
Increase plant capacity		Building	Mid '52	
Patton & Swab, Inc., Edmond, Okla.:				
Increase plant capacity, gal. per day	9,000	Authorized	1952	
Pecos Petroleum Co., Pecos, Tex.:				
Plant increase, gal. per day	22,000	Building		
Phillips Chemical Co., Borger, Tex.:				
Add reactors to carbon-black plant		Building		
New carbon-black plant, tons per year	30,000	Building	Late '52	
Phillips Chemical Co., Goldsmith, Tex.:				
New sulfur plant, tons per day	100	Building	1952	Ralph M. Parsons Co.
Phillips Chemical Co., Pasadena, Tex.:				
New vinyl pyridine plant, tons per year	1,000	Building	Mid '52	Stearns-Roger Manufacturing Co.
New ammonia-methanol-acetylene plant		Building	Early '53	Chemical Construction Co.
Phillips Chemical Co., Crane, Tex.:				
New sulfur plant, tons per day	50	Building	Mid '52	Ralph M. Parsons Co.
Phillips Petroleum Co., Midland County, Texas:				
Natural-gasoline plant, cu. ft. per day	60,000,000	Building	Late '52	
Phillips Petroleum Co., Brazoria County, Texas:				
Plant extension, cu. ft. per day	100,000,000	Building	1952	
Phillips Petroleum Co., Ector County, Texas:				
Plant increase, cu. ft. per day	75,000,000	Contracted	Early '53	
Phillips Petroleum Co., Upton County, Texas:				
New gasoline plant, cu. ft. per day	60,000,000	Contracted	Mid '53	
Plant extension, cu. ft. per day	55,000,000	Contracted	Mid '53	
Plymouth Oil Co., Tom Greene County, Texas:				
Repressure and gas-lift plant, cu. ft. per day	3,000,000	Building	1952	Hudson Engineering Corp.
Pure Oil Co., Andrews County, Texas:				
Increase plant capacity	25,000	Authorized	Late '52	
Reef Fields Gasoline Corp., Sweetwater, Tex.:				
New gasoline plant		Planned		
Royalite Oil Co., Ltd., Turner Valley, Alberta:				
Sulfur plant, tons per day	30	Contracted		Foster Wheeler, Ltd.
Shell Oil Co., Denver City, Tex.:				
Plant increase, cu. ft. per day	16,000,000	Planned		
Shell Oil Co., Fullerton, Calif.:				
Increase plant capacity, gal. per day	15,000	Building	1952	
Shell Oil Co., Ventura, Calif.:				
Increase plant capacity, gal. per day	175,000	Planned		

Eaton 2-Speeds let truck engines "take it easy"



OFF-THE-HIGHWAY in the toughest kind of going, or making time on the open road, Eaton 2-Speed Axles give truck engines a chance to work in their most efficient and economical speed range. By providing double the conventional number of gear ratios, Eaton 2-Speeds let drivers select the right ratio for every road and load. Stress and wear are reduced not only on engines, but on all power transmitting parts. Eaton-equipped trucks work harder, last longer, cost less to operate and maintain—are worth more on the trade in. Let your truck dealer explain how Eaton's exclusive planetary gearing, forced-flow lubricating system, and other features keep Eaton 2-Speeds on the job, at minimum cost.

EATON *2-Speed Truck* AXLES



Axle Division
EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

What's NEW

In Perforating, Testing, and Fishing Tool Services

McCULLOUGH
NEW SERVICES • NEW TOOLS
NEW WAYS OF DOING THINGS

Latest News About New Tools, Techniques and Services

LESS RIG TIME

with new McCullough Electric Wire Line Tools

JOBS SELECTED FROM RECENT McCULLOUGH FIELD REPORTS

*RIG TIME	McCULLOUGH TOOL	JOB ACCOMPLISHED
54 MINUTES	Glass Jet Perforator	72 holes shot at 4000 feet (greatest depth)
ONE HOUR 10 MINUTES	Magna-Tector	Located stuck point at 4500 feet
ONE HOUR 15 MINUTES	Jet Bottom Hole Cutter	Fragmentized junk at 1200 feet—two runs
ONE HOUR 45 MINUTES	String Shot	Backed-off tool joint at 6500 feet
ONE HOUR 55 MINUTES	Jet Back-Off Tool	Backed-off tool joint at 7000 feet
TWO HOURS 20 MINUTES	Type "B" Bridging Plug and running Feeler	Set plug at 6400 feet
THREE HOURS 45 MINUTES	Glass Jet Perforator	126 holes shot at 3600 feet (greatest depth)
FOUR HOURS 15 MINUTES	Radiation Well Logger (Gamma Ray)	Logging from 5600 feet to surface
FIVE HOURS	Burrless Bullet Perforator	270 holes shot at 8200 feet (greatest depth)
FIVE HOURS 10 MINUTES	Jet Casing Cutter and running Feeler	Casing cut at 13,000 feet
FIVE HOURS 45 MINUTES	Neutron Log	Logging from 4600 feet to 1000 feet
SIX HOURS 15 MINUTES	Combination Glass Jet and Burrless Bullet Perforators	306 holes shot at 8000 feet (greatest depth)
38 HOURS	Glass Jet Perforators	3700 holes shot at 10,000 feet (greatest depth)
73 HOURS	Burrless Bullet Perforators	7752 holes shot at 5000 feet (greatest depth)

*Includes setting-up at rig and tearing down equipment.

ACTUAL RIG TIME DEPENDS UPON WELL CONDITIONS. The above jobs are not the fastest, nor are they average time. Well conditions vary to such an extent that the average rig time for any specific job or tool can not be determined accurately. Yet, many of these jobs were accomplished under severe conditions, and completed successfully in a few minutes or hours.

YOU CAN BE SURE McCULLOUGH WILL SAVE RIG TIME. All McCullough electric wire line tools are electronically controlled at the surface, both visibly and audibly. This permits the tools to run faster and to be positioned accurately. Thoroughly experienced servicemen, with years of practical oil field experience, assure you reliable, consistent results—in less time.

CALL YOUR McCULLOUGH SERVICE ENGINEER TODAY

PERFORATING, TESTING AND FISHING SERVICE ANYWHERE — ANYTIME!

McCULLOUGH TOOL COMPANY

5820 South Alameda Street, Los Angeles 58, California

405 McCarty Street (P. O. Box 2575) • Houston, Texas

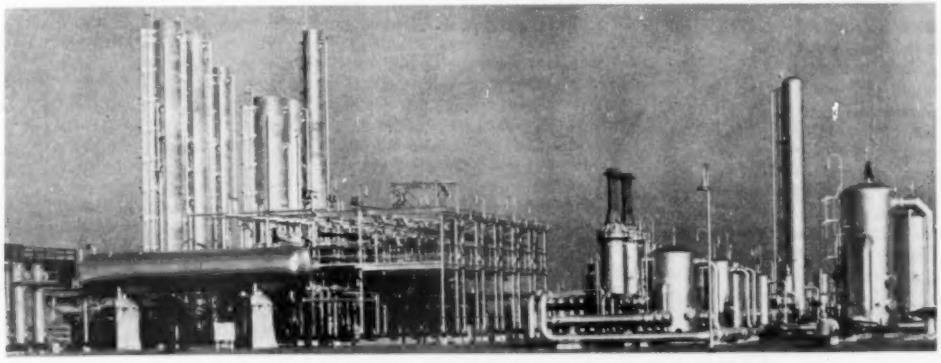
EXPORT OFFICE: Los Angeles, California

CANADA: Edmonton, Calgary, Grande Prairie, Alb.; Regina, Sask. **VENEZUELA:** United Oilwell Service Co., S.A.; Caracas, Anaco, Maracaibo

SERVICE LOCATIONS: **TEXAS:** Houston, Snyder, Alice, Cisco, Corpus Christi, McAllen, Odessa, Tyler, San Angelo, Victoria, Wichita Falls, Luling, Beaumont, Sherman, Hadacol. **OKLAHOMA:** Oklahoma City, Guyman, Healdton. **MISSISSIPPI:** Laurel. **NEW MEXICO:** Hobbs. **KANSAS:** Great Bend. **WYOMING:** Casper. **CALIFORNIA:** Los Angeles, Avenal, Bakersfield, Ventura. **LOUISIANA:** Houma, Lake Charles, New Iberia, Shreveport. **COLORADO:** Sterling. **NORTH DAKOTA:** Williston. **UTAH:** Vernal.

NATURAL-GAS PROCESSING-PLANT BUILDING PROJECTS (Continued)

Company, location, and type of project—	Capacity rating	Status	Comp. schedule	Contractors
Shell Oil Co., DeWitt County, Texas:				
Increase plant capacity, gal. per day	1,000	Building	Late '52	
Sid Richardson Gasoline Co., Winkler County, Texas:				
Enlarge plant facilities		Authorized		
Sid Richardson Gasoline Co., Pointe a la Hache, La.:				
Petrochemical plant		Planned		
Booster plant		Building		
Sid Richardson Gasoline Co., Cox Bay, La.:				
Booster plant		Building		
Skelly Oil Co., Velma, Okla.:				
Plant increase, cu. ft. per day	35,000,000	Building	Mid '52	
Skelly Oil Co., Eunice, N. M.:				
Expand plant		Building	Mid '52	
Signal Oil & Gas Co., Long Beach, Calif.:				
Plant increase		Authorized		
Signal Oil & Gas Co., Huntington Beach, Calif.:				
Plant increase		Authorized		
Southern Production Co., Brazoria County, Texas:				
New gasoline plant, cu. ft. per day	150,000,000	Planned	1953	
Spencer Chemical Co., Vicksburg, Miss.:				
Petrochemical plant, tons per day	200	Building		
Additional facilities		Contracted		Air Products, Inc.
Standard Oil Co. of Calif. (Operator), Elk Hills, Calif.:				
Natural-gasoline and repressuring plant, cu. ft. per day	50,000,000	Building	Late '52	Parsons-Macco Co.
Plant addition, cu. ft. per day	48,000,000	Authorized		
Standard Oil Co. of Texas, Snyder, Tex.:				
Add isobutane facilities		Building	1952	
Stanolind Oil & Gas Co., Andrews County, Texas:				
Injection and gasoline plant, cu. ft. per day	20,000,000	Building	Late '52	Hudson Engineering Corp.
Stanolind Oil & Gas Co., Hockley County, Texas:				
Sulfur plant, tons per day	48	Contracted	Late '52	Fluor Corp., Ltd.
Increase gasoline-plant capacity		Building	1952	
Natural-gasoline plant		Planned		
Stanolind Oil & Gas Co., Ector County, Texas:				
Sulfur-conversion unit, tons per day	17	Building	Early '53	Girdler Corp.
Texas Gas Products Corp., Upton County, Texas:				
Plant expansion		Building	1952	Texas Natural Gasoline Corp.
The Texas Co., Scurry County, Texas:				
Natural-gasoline plant, cu. ft. per day	20,000,000	Building	1952	Texas Natural Gasoline Corp.
Tide Water Associated Oil Co., Ventura, Calif.:				
Repairs to natural-gasoline plant		Building	Mid '52	W. M. Barnes Co.
Alterations to absorption unit		Planned	Late '52	
Union Oil Co. of Calif., Brea field, California:				
Increase plant capacity, gal. per day	3,000	Building	1952	
Union Oil Co. of Calif., Orcutt field, California:				
Increase plant capacity, gal. per day	4,000	Building	1952	
Union Oil Co. of Calif., Sansinena field, California:				
Increase crude-oil absorption plant, gal. per day	1,000	Building	1952	
Western Gulf Oil Co., Bakersfield, Calif.:				
Increase plant-production capacity		Building	1952	
West Texas Gas Co., Fritch, Tex.:				
Modernize plant for L.P.G. production		Planned	1952	
West Gasoline Co., Cleveland, Tex.:				
Move natural-gasoline plant		Building	1952	
Wilmington Gasoline Co., Wilmington, Calif.:				
Plant increase, gal. per day	11,000	Planned		



This West Texas natural-gasoline plant is typical of today's field-processing installations.

What Is the Future of PETROLEUM DISCOVERY?

Past and current trends give us clues as to what is to come. Here's a searching analysis of oil-discovery trends, from which an optimistic picture can be drawn with regard to our petroleum reserves.

by Paul R. Schultz

THE composite picture of discovery trends fails to support the pessimistic conclusions of those who say that we cannot find sufficient new reserves to maintain and increase our productive capacity. Undiscovered reserves are sufficient to support any level of productive capacity which this nation needs or desires.

Ultimate Reserves

The oil industry has been ultraconservative in reporting the results of its efforts, either through fear of letting competitors know what has been found or fear of accidentally overstating its assets. As time goes on and more and more of the reserves of any given area are produced, original estimates are almost universally revised upward time after time so that it is late in the life of a field before a true value of its potential is assigned.

Estimates of recent new discoveries are discounted to such a degree that unless correst adjustments to an ultimate basis are made, it cannot help but look as though the producing industry is on a downward trend. Trends of the oil industry mislead a person not familiar with oil-industry statistics and can easily lead the general public to believe that the country is running out of oil. Actually, these same statistics have misled some people within the industry.

*Expanded digest of paper presented at the Mid-Continent regional meeting of the American Association of Petroleum Geologists, Tulsa, May 13, 1952.

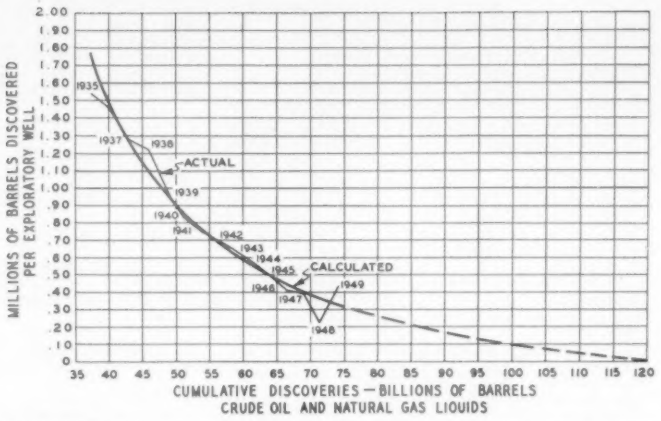


Fig. 1—Initial curve used as basis for estimating ultimate recoverable crude-oil reserves.

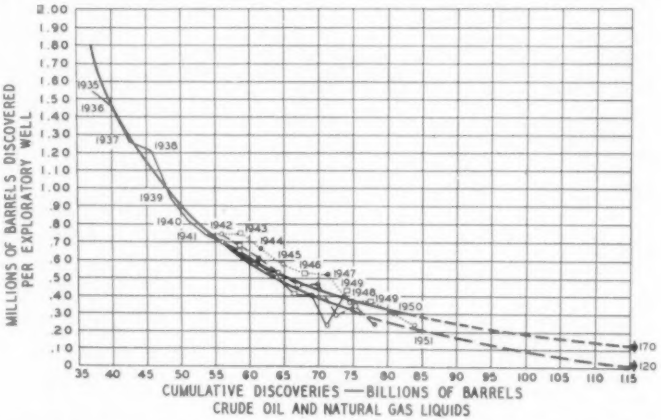


Fig. 2—Curve with but 2 years' additional information which raised estimate about 50 billion barrels.

Initial estimate . . . Several years ago Stanolind Oil & Gas Co. made a serious study of the rate at which the industry was discovering new reserves. After some experimentation it was decided that the best measure of discovery rate was the barrels of crude and natural-gas liquids discovered per exploratory well. Furthermore, it was felt that the extensions and revisions to a given field discovery should be credited to the year in which that field was discovered rather than being credited in the year in which the extensions or revisions were made.

Discovery figures of this sort were available through the work of H. J. Struth, petroleum economist, who each year publishes discovery figures crediting back the extensions and revisions to the year of field discovery. It soon became evident that there was one major difficulty with this technique. The more recent years always showed a low discovery rate since there had not been time for a sizable volume of extensions and revisions to have been made to them. This diversity in the figures was corrected for by making a historical analysis of the amount by which the figures for earlier years had been adjusted upward in subsequent years.

From this analysis a set of correction factors applicable to the last 8 years was obtained. Using the figures published by Struth covering 1949 and the previous years and our correction factors, we prepared a chart of barrels discovered per exploratory well versus cumulative discoveries. For exploratory-well information we used the data published by F. H. Lahee and his American Association of Petroleum Geologists committee (Fig. 1). It was felt that this was a significant analysis of the trends of oil discovery.

The projection of a trend line indi-

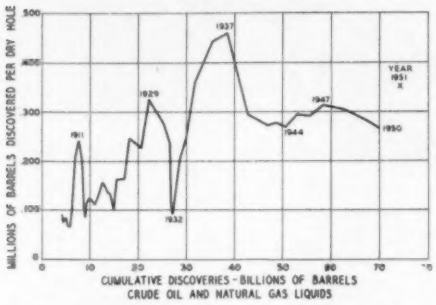


Fig. 3—Chart showing that discoveries per dry hole since 1939 are being maintained.

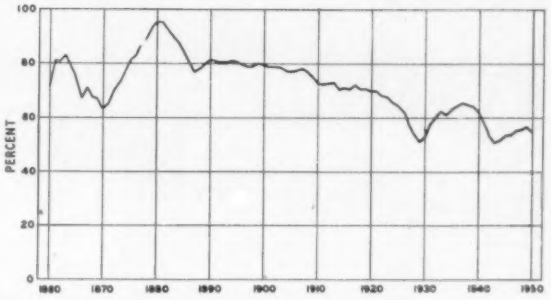


Fig. 4—Plot of percentage of total wells finding oil from 1860 to date showing long-term decline.

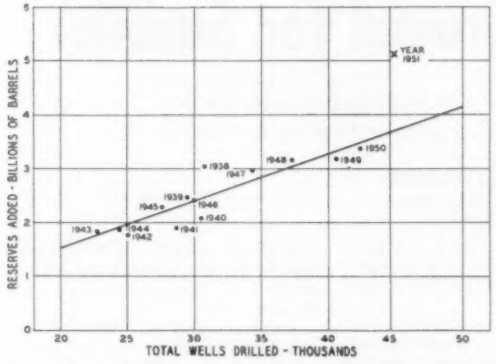


Fig. 5—Chart showing a clear relationship exists between amount of new oil added and number of wells drilled.

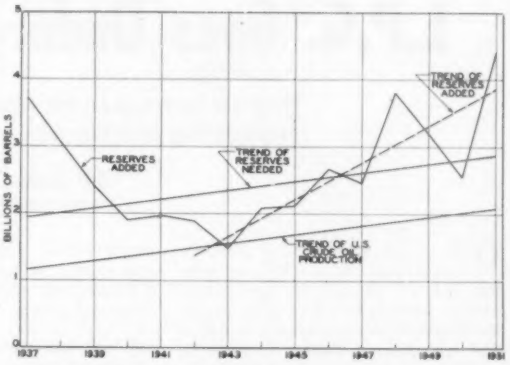


Fig. 6—Curves showing rate at which reserves are being added each year as compared to trend required to support production.

cated approximately 120 billion barrels of ultimate reserves. This figure represented a minimum because the nature of any possible corrections was such as to raise the ultimate value of oil discovery. Due to the inadequate representation of secondary operations and to offshore operations in the past data, the future of these was not included in the 120 billion minimum figure. After adjusting for these and several lesser factors, a figure of 150 billion barrels estimated minimum ultimate recovery for the United States was established.

Second estimate . . . Since the preparation of the first chart on this subject, figures for two more years have become available. They make the former position untenable (Fig. 2).

Each year the figures published by Struth, adjusted to an ultimate basis, have risen above the level where they were first set. It was thought that all necessary corrections had been made at the time of the first estimate so that no changes would be necessary as more data became available. It is obvious that figures were under-corrected.

The figures on Fig. 2 prior to 1945 are now probably quite stable and we expect little further change in them. The figures from 1945 on will probably rise still further in future years This is particularly true of the figure for 1951, since the first year of the series is always very unstable.

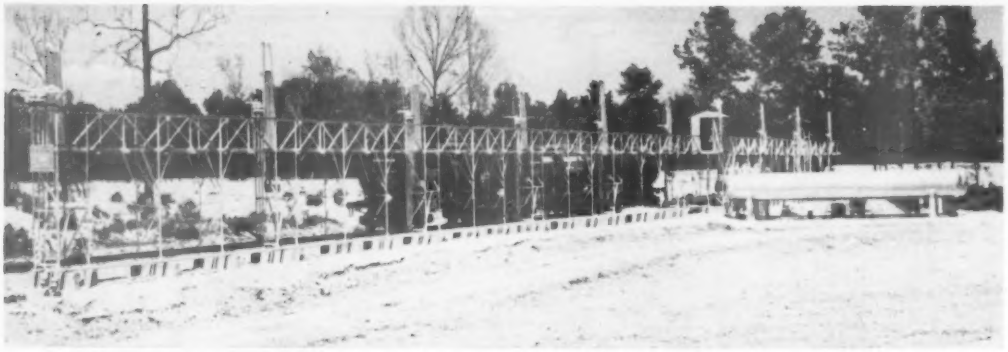
Analysis of the trend of the most recent data indicates a minimum of somewhat over 170 billion barrels. Adding to this estimated secondary recovery and offshore potentials indicates that the minimum ultimate potential for the United States can now be considered as 200 billion barrels. In view of the fact that many of the points on this curve will probably rise even further as time goes on, our estimate of the mimimum ultimate potential of this country will continue to grow.

Sound basis . . . No method exists for estimating how much oil may ultimately be found in the United States, but we believe that the method used in Figs. 1 and 2 does form a sound basis for establishing a minimum figure for the reserves ultimately to be discovered. We also believe that a minimum figure such as this can be extremely useful for it clearly demonstrates that while we do not know how much oil remains to be found we can be quite

(Continued on page 295)

THE AUTHOR

Paul R. Schultz, manager of the economics department of Stanolind Oil & Gas Co., joined the company in 1946 as chief chemical engineer. Prior to that time he was employed by Standard Oil Co. (Ind.) in Chicago. Schultz received his B.S. degree from Illinois Institute of Technology and his master's degree in chemical engineering from Case School of Applied Science. Schultz recently coauthored a technical paper entitled "Liquid Fuels from Coal and Oil Shales," and authored "Synthetic Liquid Fuels—Facts Not Fiction."



View of loading rack and surge tanks at Gibs, La., salt-dome L.P.G. underground-storage project of General Gas Corp.

L.P.G. Goes Underground for Summer

Here's a roundup on the types of storage being used, cavity engineering, and the costs and capacities of different types

by John C. Reidel
Mid-Continent District Editor

ONE of the most critical problems facing producers of L.P.G. has been the lack of low-cost storage. Rapid over-all increase in L.P.G. plant capacity coupled with high demand in winter and low demand during the summer months has at times forced producers to dump propane and butanes on the market at depressed prices or to resort to flaring.

Experiments have been in progress for a number of years with injection of L.P.G. into wholly or partially depleted salt water, gas, or distillate sands. More recently there has been an accelerated movement toward creation of underground cavities created by washing out in salt beds or salt domes. The economic preference definitely appears to be for underground storage of this type. Both producers and distributors of L.P.G. have completed, or have under way, projects of this nature. Some cavities have also been created by mining shale.

The order of economic preference, as given by the latest NPC report on underground storage,[1] is: (1) washed-out salt dome, (2) washed-out salt bed, (3) mined salt or shale, (4) mined hard-rock section, (5) natural trap reservoirs in porous rock, and (6) abandoned mine or natural cavern.

TABLE 1—POSSIBLE TYPES OF UNDERGROUND STORAGE

Washed out	Mined	Natural reservoirs
Salt beds	Existing salt mines	Traps in permeable rock
Salt domes	Shale sections	Caverns
Shale sections	Hard-rock sections	.....
.....	Abandoned coal mines	.....

Salt beds and domes . . . The first cavity washed out in a salt bed was that at Kermit, Tex., (Winkler County) during 1950.[2] Toward the end of 1951 several hundred thousand barrels of underground storage had been created. At the present time solution cavities in salt beds and domes account for over 1,000,000 bbl. of underground L.P.G. storage capacity. Indications from a recent survey[3] are that, with completion of current projects and enlargement to ultimate capacities, there will be over 3,500,000 bbl. of storage available in washed-out saline sections and domes.

Enough suitable saline sections and domes exist for the creation of an unlimited amount of storage capacity. However, distribution of these salt deposits is limited to certain areas. Bedded or sedimentary rock salt deposits (saline sections) occur in (1) Permian basin—under parts of Texas, New Mexico, Oklahoma, and Kansas; (2) Great Lakes area—or northern Appalachian geosyncline, and (3) Michigan basin—under parts of Michigan, Ohio, Pennsylvania, New York, and West Virginia.

In the Permian basin, for example, salt beds are located from less than 1,000 to about 2,000 ft. below the surface and are generally from 400 to 1,000 ft. thick. The saline beds consist of evaporites including solid crystalline sections of sodium, potassium, and magnesium chlorides with red beds and anhydrite stringers interspersed through the salts.

Intrusive rock-salt deposits (salt domes), by contrast, are very nearly pure salt deposits. They exist along the Gulf Coast to a distance inland varying from about 80 miles at Corpus Christi, Tex., to over 200 miles above Port Arthur, reaching north of Tyler and Longview in Texas, and including most of Louisiana and a portion of Mississippi (see map, Fig. 1).

Solution Cavity Engineering

In creating storage cavities by washing out salt beds, the sequence of operations usually followed is:

1. Preliminary study to determine storage site.
2. Drill open hole into salt section.
3. Core salt section and run radioactivity and electric well logs.
4. Set casing string to top of salt.
5. Set tubing string into salt section and install well-head controls.
6. Wash out salt cavity by pumping fresh water through the tubing string.
7. After washing out to desired volume, L.P.G. may be injected through the annulus, displacing water through the tubing.
8. L.P.G. may be recovered by injecting water through tubing.

After preliminary study, which includes examination of geological cross-sections, suitability of proposed storage site can be determined. Hole is drilled

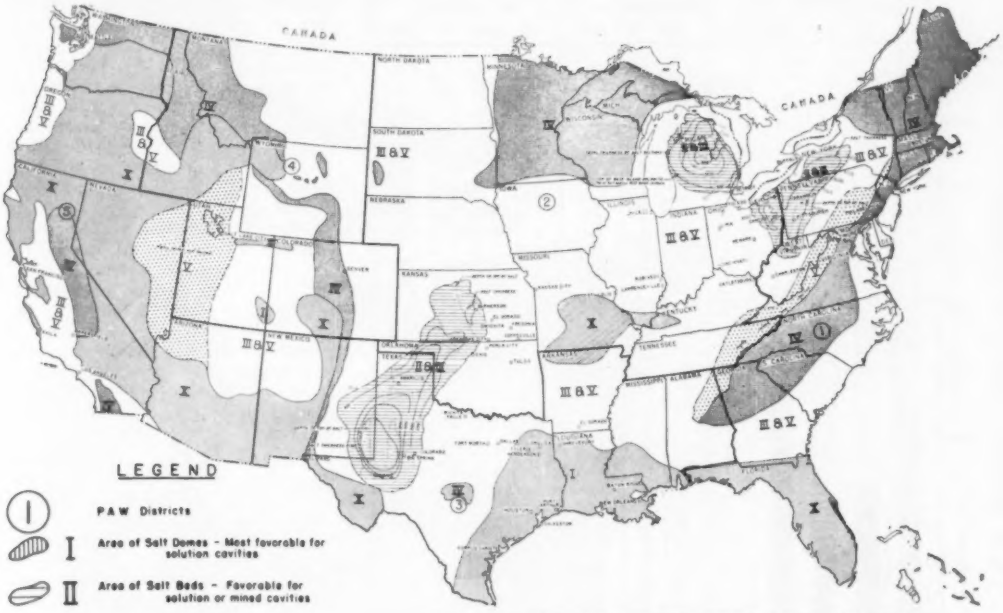

CANADA
CANADA
LEGEND
PAW Districts
Area of Salt Domes - Most favorable for solution cavities
Area of Salt Beds - Favorable for solution or mined cavities
Sedimentary - Favorable for mined cavities
Granitic, Plutonic - Favorable for cavities in hard rock
Sedimentary - Possible for injection in porous rocks limited to favorable structure
Volcanic & Sedimentary - Not favorable
Cities - Refineries in proximity

Fig. 1—Areas classified for subsurface storage. (From NPC report).

with rotary rig in the conventional manner and may be either a hole drilled especially for coring or the hole drilled for L.P.G. injection. However, it may be desirable to employ special drilling techniques during coring that will lead to virtually 100 per cent core recoveries.[4]

Washing out salt beds . . . Where solid anhydrite layer is available over the salt, the casing is prefarably cemented in the anhydrite with shoe set at top of salt. After tubing string is set, a conventional shallow-well christmas tree and a positive-displacement pump may be connected to move water into either the tubing or the annulus. While washing out, brine will be returned through the annulus to a salt-water-disposal pit. The volume of storage space being created can be checked by testing the brine for specific gravity with a hydrometer and metering the quantity of fresh water injected. However, a caliper log may also be run at various intervals during the washing-out procedure. It takes about 6 bbl. of water to wash out 1 bbl. of salt formation.

In considering the depth of formation necessary above the salt cavity a minimum depth of 700-800 ft. is considered sufficient. This must balance the vapor pressure of product being stored (200 psi. for propane) plus sufficient pressure required for pumping plus a safety factor. It must also be capable of withstanding the pressure of a column of saturated salt water during washing out or displacement of L.P.G. Safe working pressure of the formation above the salt cavity may be taken as 0.7 psi. per ft. (Fracturing may occur at 0.9 psi. per ft.) It is advisable to pressure-test the cavity during washing-out operations.

Some precautions to be observed in creating salt cavities by solution are:[5]

1. Core entire section, if possible, and obtain 100 per cent core recovery.

2. Follow coring by running electric log and/or radioactivity log. (This may locate permeable sand into which stored L.P.G. might leak.)

3. Core analysis and conditions encountered in drilling will determine whether casing can be set in anhydrite stringer or in salt. It may be desirable to set tubing string with heavy weights on bottom to prevent whipping and possible failure of tubing.

4. In washing out it is important not to form a trap by washing out back of the tubing.

5. Washing should be checked at intervals by testing gravity of, and metering, saturated salt returns and by caliper surveys to insure that no leakage is taking place.

Salt domes . . . The same procedure is followed, in general, in washing out salt domes as was described for salt beds. However, casing may be set several hundred feet into the salt. The reason for this is that the cap rock in some salt domes may be permeable and porous and may include sulfur fissures. The salt dome provides a very large section to work in, consisting very nearly of pure salt. The operator does not have to worry about anhydrite stringers during washing out. Installations can be made more economically, as a rule, in salt domes. However, it may be necessary to protect the roof in salt-dome cavities by blanketing the roof with hydrocarbon or compressed air and/or installing two strings of wash pipe, one inside the other, during washing-out operation.

Other types of cavities include washed-out shale sections, salt mines, and mined shale and other mined cavities.

Washing out shale sections . . . No ac-

(Continued on page 300)

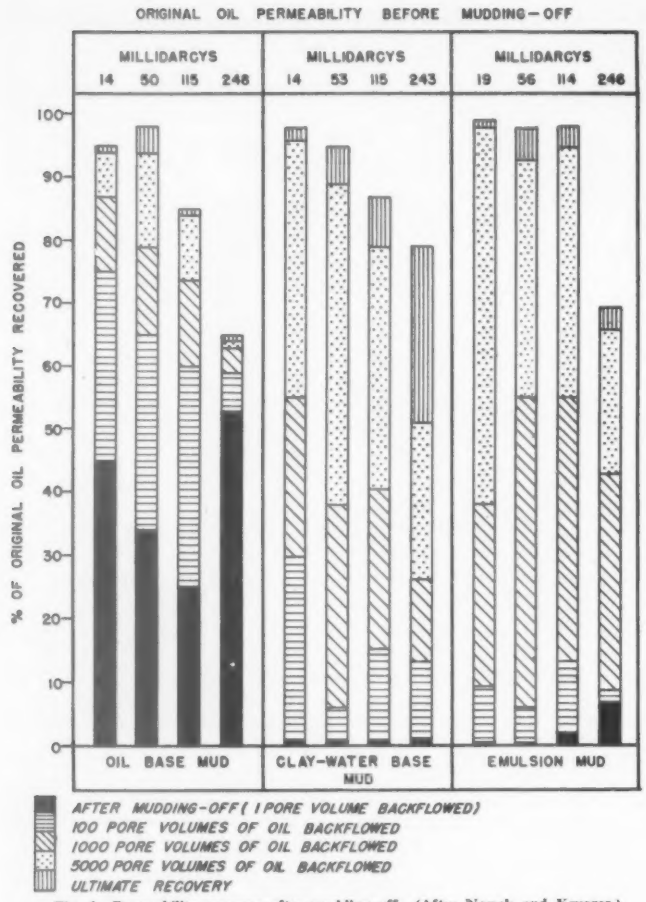


Fig. 1—Permeability recovery after mudding off. (After Nowak and Krueger.)

New Light on

Drilling and Completion Methods

. . . in the Clinton sand of Perry County, Ohio

by H. C. Slider*

THERE is every reason to believe the extended cleanout time presently existing in Clinton sand completions in Perry County, Ohio, (and in many other cable-tool areas) is unnecessary. Comparable results can be obtained on bypassing the cleanout, running a liner after shooting and placing the well on immediate production.

Casing to the top of the Clinton sand is economically justified. Use of casing in conjunction with a substantial reduction in shot sizes and closer control of shooting should eliminate the need for an extended cleanout.

*Shell Oil Co., Centralia, Ill. Presented at the spring meeting of the Eastern District, A.P.I. Division of Production, Pittsburgh.

The Primary Cleanout

It has been evident for some time that water has detrimental effect upon producing sands. In 1947 George Miller presented a study which appeared to conclusively prove that oil-base muds employed in California gave decidedly superior production results to water-base muds.[1] A more recent study of the problem has been presented by Nowak and Krueger which embraces considerable laboratory analysis and attempts to isolate the effect of mud filtrates from the effect of mud particles upon the permeability.[2] The Clinton sand may not be shaly enough to bring about a reduction in permeability through the swelling of the shale particles within the sand caused by the invasion of mud filtrate, but any sand is subject to water blocks where the percentage of water in the formation immediately surrounding the well bore becomes so great that the relative permeability of the formation to oil is reduced considerably.

Also the effect of mudding off or the forcing of mud particles into the formation by the action of the bit or bailer must be contended with in any sand. Fig. 1 graphically illustrates the results of Nowak and Krueger's experiments with mudding off as simulated in the laboratory. In most cable-tool operations, the caving of shale in the open hole would reduce a fluid approximating a clay-water base drilling mud. To give the back-flow data some added quantitative significance we will assume that the contact of the sand face with water and mud for several weeks during drilling in and cleaning out results in the sand becoming contaminated to a radial depth of 3 ft.

A well with 12 ft. of net pay would then have a contaminated pore volume of roughly 16 bbl. which would mean that 100 pore volumes would represent 1,600 bbl., 1,000 pore volumes 16,000 bbl., and 5,000 pore volumes 80,000 bbl. Although the data were never intended for quantitative analysis, there can be no doubt that the permeability of the Clinton sand is substantially curtailed by the continued contact of the sand with mud and water during drilling in and cleaning out.

Further, during the cleanout the well is more or less open to the atmosphere and large quantities of gas escape. As a result, there is a tendency for gas blocks to form in the reservoir near the well bore, the oil viscosity is increased making more reservoir energy necessary for fluid flow, and the supply of reservoir energy available for production is reduced.

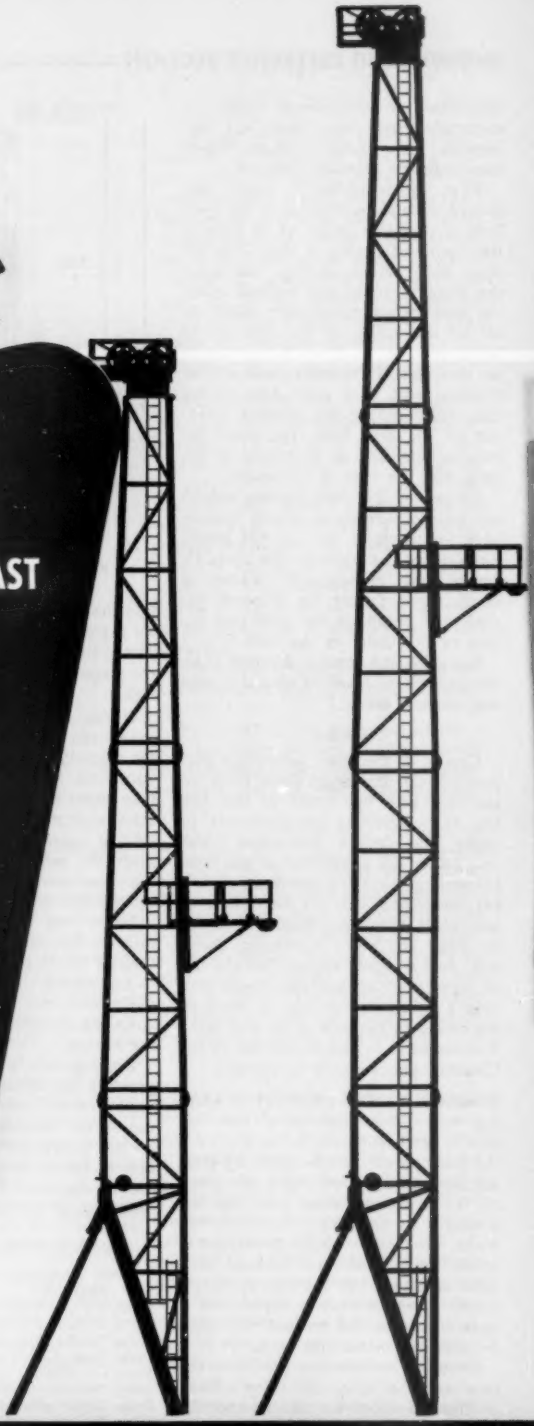
Major causes of cleanout . . . Since the cleanout is both costly and detrimental to the reservoir, it appears that its

Moore

TWO SIZES FROM ONE BASIC MAST

Get one 100 foot mast with a 15 foot leg spread. Then, with another small section and a few parts, this mast can be easily converted to 131 feet in height with an 18 foot 6 inch leg spread.

By taking out the section the mast can again be converted to the 100 foot size.



LEE C. MOORE CORPORATION

TULSA • DALLAS • HOUSTON • MIDLAND • SHREVEPORT • WICHITA • CENTRALIA • PITTSBURGH

Export Office — Room 624, International Bldg., 630 Fifth Ave., New York 20, N. Y.

elimination or curtailment would be extremely beneficial. There are apparently two major factors which necessitate the extended cleanout.

First, by permitting a sizable section of shale to be exposed to the open hole, a condition exists which permits the continued caving of shale into the open hole before, during, and after the shooting of the pay horizon. Also, the shale when mixed with water or oil by the action of the drill bit or bailer provides mud which appears to be ideal for the mudding off of the Clinton sand. Not only does caving take place during the original cleanout of the drill hole, but after the liner is run there is no reason to believe that the cave is eliminated.

Caving of the shale section behind the liner apparently is largely responsible for much of the required reconditioning of the holes in this area. Of course, the mudding-off process is much worse during the cleanout period as a result of the continued action of the bailer in the hole.

Secondly, the present shooting practices appear to result in excessive cave and cleanout time.

Casing

Casing in this area serves the purpose of: (1) preventing water from interfering with the action of the drill bit, (2) controlling encroachment of water into certain productive zones whether or not productive in this area, (3) limiting caving of soft material, and (4) minimizing wear on the drill cable and bit. If these purposes can be served by other and more economical methods, then it would appear that the use of these alternate methods would provide a substitute for one or more of the casing strings now in use and make it economical to case to the top of the Clinton sand.

Grouting . . . One possibility in keeping water from interfering with the rate of drilling would be to grout off the water in the various zones by forcing cement or plastic into the pores of the water-producing zone and allowing it to set, thus shutting off the water. However, straight grouting has never, or at least very seldom, been done in Ohio,[3] and the cost is an unknown quantity since it depends to a large extent on the method that must be employed in the operation.

Grouting by dumping plastic in the hole with the bailer and using a head of fluid to force the plastic into the formation has met with good but erratic success as can be seen from results cited in Table 1. It should be noted that the success of the operation, even for a given formation, is unpredictable. The difficulty may be in maintaining the proper head or pressure in the bore hole.

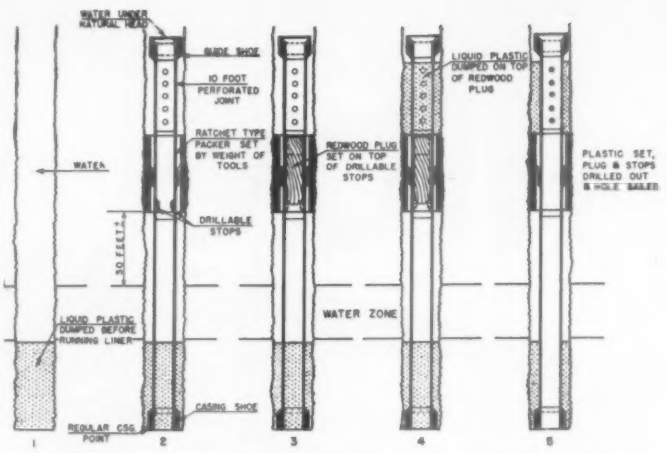


Fig. 2—Proposed method of setting liner-packer assembly. (After J. R. Lockett.)

If too little pressure is applied to the aquifer (water-producing formation) the formation will flow water into the bore hole. Such flow will continue to take place since more shallow formations exposed to the open hole will take at least small quantities of water from the bore hole. This will cause the continued flow of water even though the head or pressure remains constant and no fluid is introduced into the bore hole at the surface. Further, if too high an applied pressure is maintained, the flow of water into the aquifer will be too rapid to guarantee the effective setting of the grouting material.

Consequently, it does not appear that grouting in cable-tool drilling is advisable at the present time. However, the writer believes that grouting may in the future provide the ideal solution to cable-tool casing problems and should therefore be kept under consideration at all times.

Liner-packer assembly . . . Another method that might be employed as a substitute for casing is that of setting a liner and packer assembly to prevent the entry of water into the bore hole. By using a liner-packer assembly the flow of water is eliminated while the plastic is setting. This proposed method was devised by J. R. Lockett, formerly of Ohio Fuel Gas Co.,[4] and embraces the use of a plastic compound in connection with the liner-packer assembly. When the casing point has been reached, a liner of the usual casing size is assembled with the ratchet-type packer which is arranged to set about 30 ft. above the producing zone.

The packer contains stops that allow a bailer to pass, but seat a suitable plug. Above the packer is assembled a 10-ft. joint of perforated casing equipped with a guide shoe or belled nipple and the entire assembly is hung in the hole at the surface. The operation is then performed in the following manner (refer to Fig. 2):

1. Through the assembly plastic is placed in the hole with a dump bailer

(Continued on page 341)

TABLE 1—RESULTS OF PLASTIC GROUTING[3] IN CABLE-TOOL DRILLING

State, pool—formation sealedoff—	Feet sealed	B.H.T. (°F.)	Condition before plastic used	Condition after plastic used
Texas, Novice—Strawn sand	43	140	Hole full water	100 per cent shutoff
Texas, Novice—Strawn sand	26	140	Hole full water	100 per cent shutoff
Texas, Novice—Strawn sand	90	140	Hole full water	Hole full water
Texas, Peek—Caddo lime	23	154	Highly permeable zone	100 per cent sealedoff
Texas, Breckenridge—Caddo lime	14	130	Bail 200 B.W.P.D.	90 per cent shutoff
Texas, Wildcat—Marble Falls	49	173	Hole full water	100 per cent shutoff
Texas, Bryson—Marble Falls	74	172	Hole full water	Hole full water
Texas, Wildcat—Sand	16	160	Hole full water	70 per cent shutoff
Texas, Oldan—Sand	25	70	Excessive gas	100 per cent shutoff
Kentucky, Uniontown—Cypress	35	93	Permeable thief sand	100 per cent shutoff
New Mexico, Maljamar—Lime	11	90	100 per cent water	100 per cent shutoff

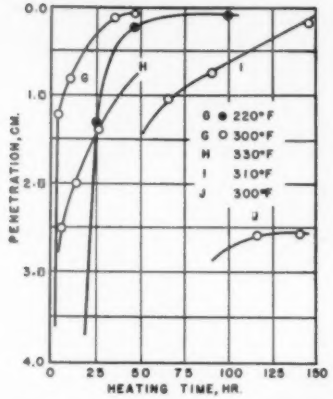


Fig. 1—Effect of time of heating on thickening of limed field muds.

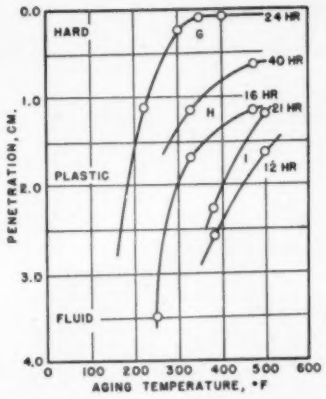


Fig. 2—Effect of aging temperature on thickening of limed field muds.

Some factors affecting Solidification of Lime-Treated Muds at High Temperatures

Here are the results of a study of the mechanism of hardening of these materials at high temperatures

by G. R. Gray,* M. Neznayko,* and P. W. Gilkeson*

WITHIN the last 8 years, lime-treated mud has come to be regarded as the best available for deep drilling in the Gulf Coast area. At present, relatively few wells are drilled below 10,000 ft. with any other type of drilling fluid. Ease of control, economy of maintenance and resistance to contamination characterize lime-treated muds.[1,2,3,4,5]

But along with these desirable features, some undesirable properties have appeared, especially in deep hot holes. Occasionally the logging electrode fails to reach bottom and, when the bit is run back into the hole, no bridge is found but thick mud is pumped out. In other instances, excessive pressure is required to break circulation after a trip, drill pipe is stuck, perforating guns do not go to the depth desired, or packers cannot be pulled after a production test.

While these difficulties are not prevalent, and by no means are restricted to wells drilled with lime mud, they have been traced definitely, in a number of cases, to thickening of the lime-treated mud on standing in the hole.

The solidification of lime-treated mud was attributed at first to loss of water from the mud under the conditions of temperature and pressure prevailing in the hole. But loss of water by filtration obviously could not occur in a cased hole. Also, fragments of stiff mud recovered on the shaker screen had practically the same water content as the original mud.

These observations prompted a study of the mechanism of the hardening of lime-treated muds at high temperature.

Effect of Pressure

On the basis of storage tests at pressures up to 1,500 psi., it was concluded that pressure was not a significant factor in the thickening of lime muds.[6] It seemed desirable, however, to test this conclusion at pressures equal to, or exceeding those found in deep holes filled with heavy mud. Comparative tests were made, therefore, between samples of field muds aged under applied pressure and samples aged under the pressure of steam at the same temperature.

Original muds were high-pH, lime-treated, oil emulsions, containing water, diesel oil, caustic soda, lime, organic thinners, starch, clay, barite, and some shale and sand from the formations drilled. Penetration tests were run on muds stored under pressures up to 20,000 psi. and compared with mud aged at 118 psi. Differences were so slight as to be within the limits of precision of the measurements.

Effect of Time of Heating

Experience in the field has shown that the time the mud remains undisturbed in a hot hole determines the degree of thickening. The time required to make a round trip in a deep hole may be long enough for the mud to solidify to such an extent that the rig pumps are inadequate to break circulation on bottom. It may be necessary to break circulation several times while going in the hole and even to wash down each joint as the bottom is approached.

The effect of time of heating on the consistency of four field muds is shown in Fig. 1.

Properties of the muds before heating are listed in Table 1. These were lime-treated oil-emulsion muds similar in composition to the muds described above.

The muds differed in the rate of thickening on heating. Marked changes occurred in short times. Mud A became plastic in only 4 hours at 300° F. In contrast, Mud C remained fluid at the end of 48 hours and was plastic after 65 hours. Mud B was about as stiff after 25 hours as Mud A was after 4 hours. Mud A was hard after 24 hours at 300° F., while Mud D was still soft plastic after 9 days.

Effect of Temperature

The temperature in several wells drilled to 10,000 ft. in South Texas has been found to increase about 15° F. for each 1,000 ft. At 15,000 ft., the temperature might be expected to be about 300° F., but several wells have shown higher temperature gradients, with temperatures approaching 350° F. at 15,000 ft. With increase in depth and accompanying rise in temperature has come more difficulty in preventing the thickening of lime-treated mud.

The effect of temperature of aging on the stiffening of these field muds is shown in Fig. 2.

These tests show that hardening is promoted by increasing temperature. Mud A, which was a stiff paste after 24 hours at 220° F., was hard after the

*Baroid Sales Division, National Lead Co., Houston. Summary of paper presented at the spring meeting of Southwestern district, A.P.I. Division of Production, Shreveport, La.

TABLE 1
Properties of Field Muds Used in Study of Effect of Temperature and Time on Thickening

Field mud—	A	B	C	D
Weight, lb./gal.	14.2	16.2	15.5	18.0
Viscosity, Funnel, sec.		57	50	73
Viscosity, Stormer, cp.	164	71	55	140
Initial gel, g.	5	0	0	0
10-minute gel, g.	90	5	0	2
pH	12.7	12.8	12.9	12.9
Filter loss, A.P.I., cc.	2.0	4.2	4.6	1.7
Cake, 32nd. in.	2	2	2	1
Oil, per cent by vol.	22.8	5.9	6.0	10.0
Solids, per cent by vol.	28.2	34.1	33.0	38.4
Lime, lb. per bbl.	15.7	7.5	6.8	7.5
Filtrate analysis—				
Alkalinity, P	10.4	4.8	5.4	7.2
M	12.9	11.0	7.5	9.1
Chloride, e.p.m.	110	85	56	28
Sulfate, e.p.m.	30		10	45
Calcium, e.p.m.	11	12	20	36

same time at 300° F. Mud B, which had just begun to set after 16 hours at 250° F., was stiff after being heated at 475° F. for 16 hours.

Numerous tests on both field muds and laboratory preparations have shown that chemical changes occur on aging lime-treated muds at high temperatures. Alkalinity of mud and of filtrate decreases. After heating, pH is lower, P (phenolphthalein) and M (methyl orange) values for the filtrate have decreased, and lime content, based on titration of the mud, is less. As might be expected, resistivity of the mud rises as the hydroxyl-ion concentration is lowered. These changes occur in all cases of solidification and also in muds which do not become hard in the period of heating.

Illustrating the changes in alkalinity which occur on heating, Table 2, gives some properties of three field muds before and after aging at 250° F. Mud E became hard after heating 98 hours at 250° F. Alkalinity of the filtrate decreased, the P value about 50 per cent and the M value 30 per cent. Lime content calculated from the titration of the mud dropped 50 per cent. Although Mud F remained fluid after 64 hours at 250° F., the alkalinity and lime had decreased to a greater degree than occurred with Mud E. Mud G, which was stiff after 20 hours at 300° F., showed a marked reduction in alkalinity of both mud and filtrate.

In most cases, the calcium-ion concentration in the filtrate was found to increase on heating field muds. There is, however, some doubt as to the reliability of the analyses. In deeply colored filtrates the end point of the versenate titration was hard to see. In a number of instances, although the change in color could be seen easily in the filtrate from the original mud, after heating the mud the end point in the titration was uncertain. Differing from field muds, the calcium-ion content of the filtrate of a lime-bentonite slurry decreased on rolling at 150° F. and on storage at 300°.

A few estimations were made of silicate and aluminate in the filtrate. On heating a freshly prepared lime-bentonite mud, aluminate and silicate at first increased, then decreased as the mud became stiff.

Changes occur in the organic materials in the mud. Quebracho, lignitic compounds, and starch, all of which usually are present in lime-treated muds, decompose in part when the mud is heated. Decomposition is evident from the odor of the heated muds, as well as from changes in the color of the mud and of the filtrate. The aged muds frequently have an ammonia-like odor. Tannin content of the filtrate of a mud containing quebracho may be reduced by half as a result of heating the mud 24 hours at 300° F. The lignitic thinners decompose also, but less rapidly than quebracho. Starch is broken down to dextrin and other products which are less effective in reducing filtration than starch.

TABLE 2—EFFECT OF AGING AT HIGH TEMPERATURE ON THE CONSISTENCY AND ALKALINITY OF FIELD MUDS

Initial properties:	Mud E				Mud F				Mud G			
Weight, lb./gal.	16.6				10.1				15.1			
Viscosity, Funnel, sec.	98				38				62			
Viscosity, Stormer, cp.	91				15				79			
Initial gel, g.	0				0				0			
10-minute gel, g.	30				0				10			
	13.1				13.0				13.1			
Filter loss, A.P.I., cc.	6.0				2.3				3.8			
Cake, 32nd in.	4				1				2			
Solids, per cent by volume	39.0				11.0				34.4			
After aging at elevated temperatures:												
Temperature, °F.	250				250				300			
Time, hours	0	16	80	98	0	16	64		0	6	20	
Viscosity, Stormer, cp.	91	62	94	*	5	145	270		79	130	*	
Lime, lb./bbl.	12.0	9.7	8.3	6.2	4.3	2.4	1.5		11.2	8.5	2.8	
Filtrate analysis:												
Alkalinity, P	6.6	6.4	5.3	3.5	6.8	2.5	0.6		8.6	7.0	0.1	
M	8.0	8.7	7.4	5.6	8.1	4.4	2.0		11.1	9.7	3.3	
Calcium, e.p.m.	12	13	15	8	0	0	0		13	12	27	

*Sample was hard.

TABLE 3—ALTERATIONS IN CLAY MINERALS UPON HEATING WITH SODIUM AND CALCIUM HYDROXIDES

Eight Per Cent by Weight Centrifuged Bentonite Heated at 250° F. for 4 Days

			Mineral content from X-ray analysis*					
Base added—	Lb. per bbl.	Mud consistency	Mont-morillonite	Kaolin group	Quartz	Calcite	Anal-cite	Xonot-lite?
	0	Plastic	90		<10			
Sodium hydroxide	8	Fluid	40-50				30-40	
Calcium hydroxide	12	Hard	20					30-50
Sodium hydroxide	8	Hard	20					10-20
Calcium hydroxide	12	Hard	20					10-20

Thirty Per Cent by Weight Glen Rose Shale Heated at 300° F. for 4 Days

	0	Semiplastic	30-40	10-20	20	20-30		
Sodium hydroxide	8	Plastic	20	10-20	10	20-30	30	
Calcium hydroxide	12	Hard	10-20	10-20	10-20	20		
Sodium hydroxide	8	Hard	?	?	Trace	20-30	30	
Calcium hydroxide	12	Hard	?	?	Trace	20-30	30	

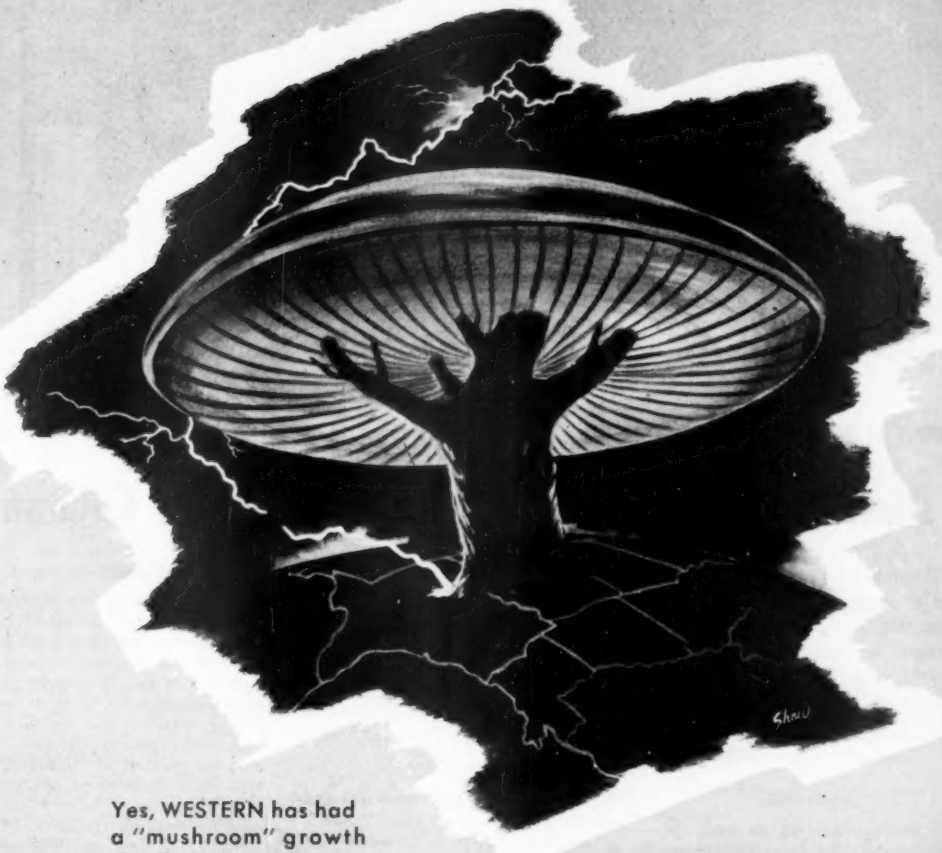
Changes in Clay Materials

The decrease in alkalinity of the mud on heating suggested a reaction between the bases and other components of the mud. The clay and finely divided sand always present in the mud seemed to provide suitable reactive material.

In exploratory work, the effect of caustic soda on shale was investigated. Drill cuttings from the Glen Rose formation (obtained from a well in Panola County, Texas, while drilling between 3,500 and 4,500 ft.) were used to

(Continued on page 315)

We Crossed the Mushroom with the Mighty Oak!

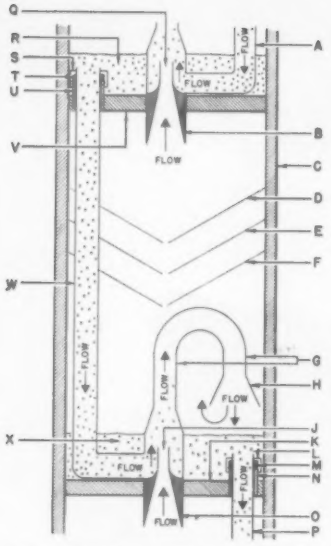


Yes, WESTERN has had a "mushroom" growth chiefly because Western knows its business — and enjoys applying it! And this growth has been solid, too — as staunch as an oak. For Western service is built on confidence and the ability to get the job done — better! You'll enjoy the progressive and friendly spirit which goes with every Western service.

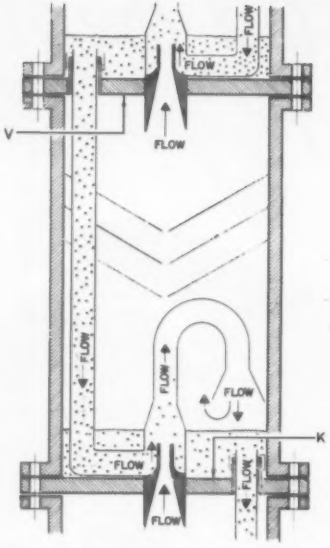
WESTERN
Engineered
WELL SERVICES

General Offices
Midland, Texas

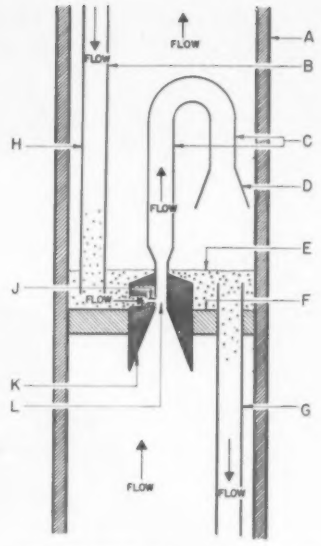
ACIDIZING • JET & BULLET PERFORATING • RADIOACTIVITY WELL LOGGING • BRIDGE PLUGS & PRODUCTION PACKERS



JET CONTACTOR Schematic illustration (Fig. 1).



INSTALLATION of jet contactor plates between flanges (Fig. 2).



ANOTHER TYPE of jet contactor (Fig. 3).

Here's a new type of

Distillation, Absorption, and Extraction Column

Utilizing the principles of fluid dynamics, the author has designed a jet contactor to provide more intimate mixing of liquid and vapor on trays in columns used for separation processes. Liquid and vapor are mixed in a high-velocity tube to give a high degree of turbulence. This mixing causes an increase in the rate of mass transfer and destruction of any areas of localized turbulence.

by M. R. Cannon*

Introduction

AN understanding of the basic principles of fluid dynamics is of great value in the design of many important industrial and laboratory devices. It is the purpose of this article to show how the unique and fundamental difference between velocity pressure and static pressure may be exploited in the design of new types of equipment with important practical advantages.

Velocity Pressure

The average engineer speaks of "pressure" as though there were only one kind. What he usually has in mind, although he does not say so, is "static pressure." There is a fundamental difference between static pressure and velocity pressure.

That fundamental difference is this: Static pressure is equal in all directions whereas velocity pressure has no component at right angles to the direction of the flow and it exists only in the direction of flow. Velocity pressure is a result of molecules in motion and it is exerted in the direction that the molecules move.

A fluid at rest has zero velocity pressure and finite static pressure. A fluid in motion has finite velocity pressure and finite static pressure. Equipment can be designed which will simultaneously cause a decrease in static pressure and an increase in velocity pressure, or, will increase static pressure at the expense of velocity pressure.

The Mathematics Employed

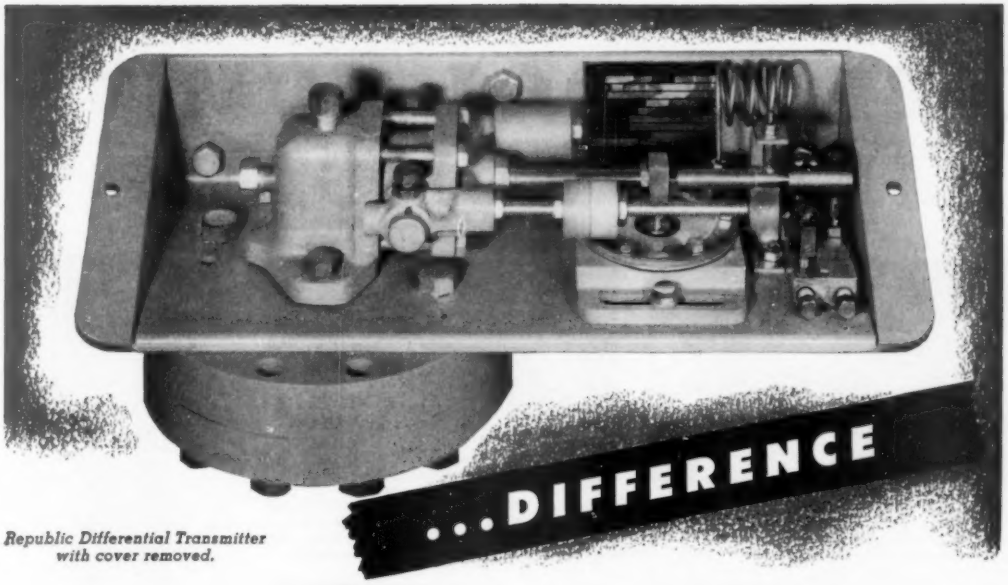
Bernoulli's theorem is a statement of the law of energy conservation for fluids in motion, for those cases where the energy changes are primarily mechanical. For the completely general energy equation for fluids in motion the flow equation for the first law of thermodynamics is rigorous.

For the purpose of illustrating the simultaneous decrease in static pressure and increase in velocity pressure, Bernoulli's theorem (Equation 1) will be written and then simplified for the case where a liquid is flowing through a horizontal, gradual constriction such as a venturi throat.

$$X_1 + P_1V_1 + \frac{U_1^2}{2g} + \int PdV + W = X_2 + P_2V_2 + \frac{U_2^2}{2g} + \Sigma F \qquad (1)$$

Since the flow is horizontal $X_1 = X_2$, and since it is a liquid, the compressibility is very small and therefore $\int PdV$ is negligible in magnitude, and since no energy is being put into the system between reference planes 1 and 2, $W = 0$. Neglecting friction, for the moment, then the above equation reduces to:

*Consulting chemical engineer, registered professional engineer, State College, Pa.



Republic Differential Transmitter with cover removed.

Spells *PLUS* PERFORMANCE

The Republic Pneumatic Transmitter combines machine ruggedness with instrument precision to provide matchless performance in measuring flow, level, pressure or density of a wide variety fluids. By any or all of the following points, the Republic challenges comparison:

ACCURACY of the Republic force-balance principle is higher than can be consistently secured and maintained with any other method. 1/2 of 1% guaranteed.

TEMPERATURE variations of ambient atmosphere have negligible effect on the accuracy of the Republic transmitter.

CHANGES IN AIR SUPPLY PRESSURE do not affect the accuracy of a Republic transmitter to any significant extent. A 5 psi change produces an error of less than 1/10%.

CHANGES IN LINE PRESSURE—Republic differential transmitters are not affected by variations in line pressure. A patented and exclusive simple adjustment assures this protection.

SENSITIVITY—Due to the negligible motions required for complete operation of all parts, for a full scale change, no appreciable hysteresis results from reversal of direction of measurement change.

VIBRATION of any normal frequency has no effect on the Republic transmitter.

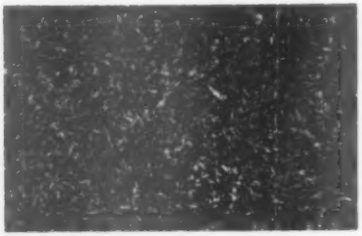
LEVELING—Since all parts are balanced, and no liquid is used for calibration, Republic transmitters need not be leveled exactly, and may be adjusted for installation in any position.

FOR TWELVE YEARS Republic Pneumatic Transmitters have delivered unmatched performance in every type of installation. Complete details of design and operation, plus numerous application suggestions are combined in Data Book, 1002. Send for your copy, today.

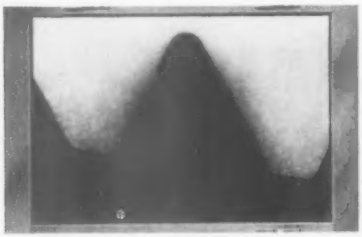
REPUBLIC FLOW METERS CO.
2240 Diversey Parkway, Chicago 47, Illinois

Five important reasons why
REED TOOL JOINTS LAST LONGER!

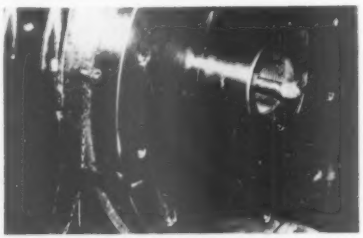
BETTER STEEL. REED specifications for a tool joint steel call for *better* properties than those obtained from AISI specifications based on chemical and hardenability requirements only.



"TAILORED" HEAT TREATMENT. REED "tailors" heat treating to each heat of steel instead of using a treatment based on average analysis. This makes **REED** Tool Joints even stronger and more wear resistant.



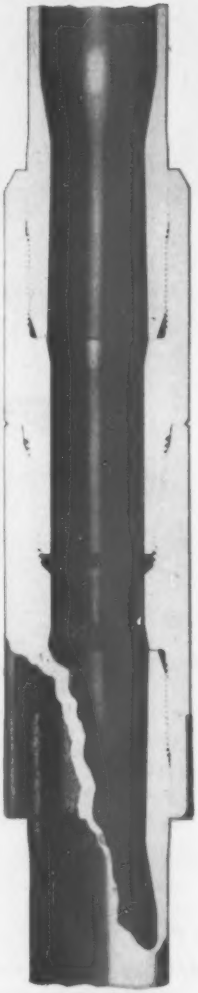
ACCURATE THREADS. REED uses many modern inspection tools—including the thread comparator shown here—to make sure the threads on the tool joints you get are absolutely accurate.



PERFECT ALIGNMENT. REED uses special adapters in machining that assure perfect alignment of every **REED** Tool Joint. Perfect alignment prevents the high stresses and uneven wear and whip that could cause drill string failure.

TREATED THREADS. Wearing threads of all **REED** Tool Joints are given a treatment that changes the surface of the steel into a complex metal phosphate. This surface acts like a lubricant and prevents galling.

The more you know about **REED** Tool Joints, the better you can understand why they last longer. This longer life means greater safety and lower drill string costs. It is the main reason why leading operators all over the world specify **REED** Tool Joints.



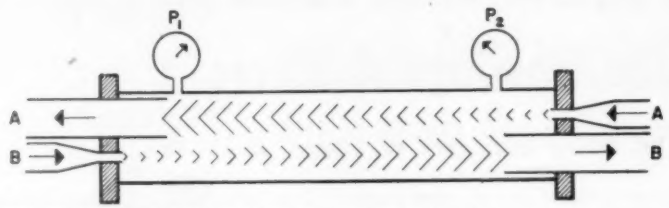
REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

NEW YORK LONDON BUENOS AIRES

3583

Gulf Coast, Mid-Continent, Rocky Mountain and Canadian Distributor for Martin-Decker Products



STATIS PRESSURE does not determine flow direction (Fig. 4).

$$P_1V_1 - P_2V_2 = \frac{U_2^2}{2g} - \frac{U_1^2}{2g} \quad (2)$$

Since $V_1 = V_2 = 1/\rho$, it follows that:

$$(P_1 - P_2) = \frac{U_2^2}{2g}\rho - \frac{U_1^2}{2g}\rho \quad (3)$$

Equation 3 explains why an increase in velocity pressure is accompanied by a decrease in static pressure. The mathematical definition of velocity pressure is given by Equation 4:

$$P_1 = \frac{U^2}{2g}\rho \quad (4)$$

If friction is not neglected, the right side of Equation 2 has the ΣF term added to it. This in no manner invalidates the above reasoning, it simply means that the degree to which static pressure is converted into velocity pressure is reduced.

While the foregoing mathematics explain the interrelationships between velocity pressure and static pressure it requires some new and novel designs in equipment to take advantage of the basic principles of fluid dynamics that are involved. Some illustrations follow as to how this may be done.

A New Type of Distillation Column

A distillation column built in the manner illustrated in Fig. 1 takes advantage of the basic principles under discussion. Note that the liquid from one plate flows into the throttled vapor stream at a venturi-like construction where static pressure is relatively low and velocity pressure has been increased, at the expense of the reduction in static pressure.

The jet of high velocity vapor at J will carry the liquid through the tube G which has a U bend as shown so that the discharged mixture of liquid and vapor tends to be thrown down toward the plate K—this is the direction that is desired for the liquid droplets. While in the high-velocity tube G the phases are in a high degree of turbulence which is excellent for increasing the rate of mass transfer between the phases and the destruction of any areas of localized equilibrium.

The vapor will flow upward through D, E, and F which are entrainment separators. For example, D, E, and F may be porous media or screens of of suitable mesh or they may be coarse screens with an efficient packing between them such as the author's protruded packing.[1 2 3] Upon passing through entrainment separators, the vapor streams flows upward and is throttled through the next plate by the venturi-like tube, B. The liquid will flow downward through tube W into the throttled vapor stream on the plate below.

A column built on these principles will have important advantages over present-day equipment. These are:

1. The maximum daily operating capacity for a given diameter is greatly increased.

2. The plate spacing can be smaller than in conventional columns since gravity flow of the liquid from plate to plate is not essential.

3. High turbulence and high shear rates in the tubes G tend to increase mass transfer rate between the phases.

4. The presence of a liquid, gradient head across the plate will cause no trouble.

5. For a given daily capacity, such a column will be shorter in height and smaller in diameter thus requiring a smaller amount of material of construction as well as smaller and simpler and less costly foundations.

6. The two phases cannot bypass each other—the design principle assures their intimate and turbulent contact.

Generality of the Design

The application of this design to absorption columns is so similar to distillation that no further comment is necessary.

It will be excellent in liquid-liquid extraction because not only will capacity be increased but the turbulent and excellent stirring that takes place in tubes G is even more important in liquid extraction than in distillation.

For the case where the continuous liquid phase is of lower density than the discontinuous liquid phase, the extractor would be installed as shown in Fig. 1 with the continuous phase entering the bottom. However, if the continuous phase were of higher density than the discontinuous phase, then the plates would be installed in the reverse manner, i.e., the plates shown in Fig. 1 would be revolved through 180°, and outlet tubes H would all point upward instead of downward. In such a case the continuous phase would be pumped into the top of the tower instead of the bottom.

A suitable name for a piece of equipment designed according to these principles would be a "jet contactor." It works because the continuous phase is throttled to a jet through J and develops sufficiently velocity pressure to carry itself and the discontinuous phase through tube G and because the discontinuous phase is led from one plate to the next through the throttled stream where static pressure is low. This latter factor accounts, in a large measure, for the high capacities obtainable.

In general, a column would have more than one plate. Fig. 1 shows parts of two plates.

Modifications

There are, of course, many possible modifications that may be desirable for specific purposes. For example, if temperature control is important a coil with a circulating heat-transfer medium may be inserted in the discontinuous phase on plate K and may, if desirable, extend into the space above this plate.

The inlet and outlet ends of such a coil can either be taken directly through the column walls or by suitable machining and sealing taken directly through plate K to the outside of the column. Temperature may also be controlled by jacketing the column or tube G or both with a circulating heat-transfer medium. The plate K may be also constructed as to fit between companion flanges if desired as shown in Fig. 2.

Fig. 3 illustrates another possible modification in design for cases where some recirculation of liquid on the plate may be desired. However, such equipment will not have as high a capacity (gallons per hour throughput) as the type illustrated in Fig. 1.

Other modifications are obvious such as using more than one jet J and return tube P per plate and having man-hole plates on plate K for large-diameter columns. It may also

(Continued on page 318)

Effect of Hydrodynamic Forces on Pipe-Line Crossings of Rivers

by Leo M. Odom and Jere W. Higgs, Jr.

"It is the objective of this paper to make available to those responsible for the design of pipe-line crossings the essential features of recent investigations concerning the mechanism of turbulence as they apply to pipe-line-crossing designs. The fundamental theory of turbulent flow is discussed and the basic derivations necessary for an understanding of the phenomena are given.

"The method by which pressure differentials resulting from turbulence may be calculated is illustrated. A brief discussion of the effect of turbulence on submerged pipe lines is included. The characteristics of drag and the resulting loads are also briefly considered.

"A brief bibliography is given to aid the reader in a more detailed study of turbulent flow."

THE crossing of major streams with oil and gas pipe lines is one of the most serious problems facing the industry today. In the early days of the business when small lines were involved the flexibility of the lines, the relatively small surface which they presented to hydrodynamic forces, and particularly the comparatively small amount invested minimized the importance of the careful selection of the crossing site, as well as of the design of the crossing to resist or avoid the actions and forces displayed by rivers which tend to disrupt the line. The large lines being built today, however, necessitate the most careful selection and design of crossings that it is possible to make.

Rivers which flow in beds and between banks consisting of their own alluvium, of which the lower Mississippi River is typical, present the greatest variety of problems. Such streams tend to meander widely, caving their banks, building bars, and sometimes cutting off entire bends. Besides the variations in the bed due to meandering there are cyclic changes in bed elevation due to the rise and fall of floods.

A pipe line crossing a natural stream if partially or wholly exposed above the bed is subjected to loads resulting directly from hydraulic phenomena as well as loads resulting from changes in the location of the stream's bed and banks. The phenomena which cause these loads are drag and turbulence.

Drag is the relatively familiar phenomenon resulting principally in a force acting on the pipe in a downstream direction. Turbulence results in forces which are perhaps, more difficult to visualize than drag forces but which are of even more significance in designing an underwater pipe line.

Turbulence manifests itself in the form of large and small eddies. These eddies can transfer momentum, mass, heat, suspended material, etc., from one part of the stream to the other. Turbulence in natural streams is one of the most readily apparent phenomena of flow, but only recently have the mechanics of fluid turbulence been well enough understood and sufficient data been collected to permit reasonably approximate assumptions regarding the design of structures to resist turbulent action. The practicaliy universal presence of turbulence and the importance of its effects require that turbulent phenomena be studied before a detailed study may be made of any flow characteristics of natural streams.

Turbulence in a stream is accompanied by pressure fluctuations which result in loads on submarine structures which may be highly significant. The mathematical approach to the determination of these loads has been developed but, as yet, the experimental data are very scanty.

THE AUTHORS

L. M. ODOM

J. W. HIGGS, JR.

Leo M. Odom is associated with Dewitt L. Pyburn in the private practice of civil engineering under the firm name of Pyburn & Odom at Baton Rouge. The firm has done a great deal of consulting work on pipe line crossings of rivers and streams. Odom was chief engineer of the Department of Public Works of Louisiana for 8 years and was employed by the Army Engineers on river and harbor and flood control work for 12 years. He worked in the bridge department of the Louisiana Highway Department for 2 years immediately following his graduation from L.S.U. He is the author of several papers on river engineering.

Jere W. Higgs, Jr., holds a B.S. degree in civil engineering from Texas A. & M. He has been associated with Pyburn & Odom since receiving an M.S. degree in Hydraulic Engineering from L.S.U. in 1949.

Fundamental Theories of Turbulent Flow

Flow is characterized as laminar or turbulent. In laminar flow the fluid moves in parallel layers having different speeds. Turbulent flow, on the other hand, is characterized by variation in direction as well as magnitude of velocity.

The existence of a definite criterion for determining whether flow would be laminar or turbulent was first demonstrated by the classic experiments of Osborne Reynolds, the results of which were published in the 1880's. Reynolds' apparatus consisted of a smooth glass tube attached to a reservoir containing water. The tube was provided with a bell-mouthed entrance to minimize flow disturbances and a means for injecting a filament of dye into the water flowing through the tube. It was found that at low velocities in the tube the dye filament remained intact; but as the velocity in the tube increased the dye diffused throughout the flow cross-section.

Laminar flow was the term applied to flow in which the dye filament, which may be regarded as representative of the path of a "water particle," remained intact and followed a path parallel to the tube walls. Turbulent flow was the term applied to flow in which the dye diffused throughout the tube cross-section.

Reynolds found that the occurrence of turbulence in his apparatus was directly related to the relative impor-

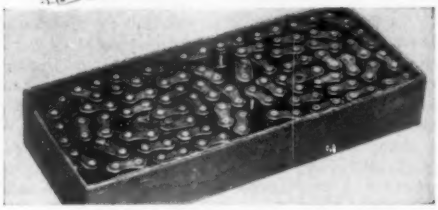
CHAIN ASSEMBLY . . . CHAIN REPAIR

THERE'S NOTHING TO IT!

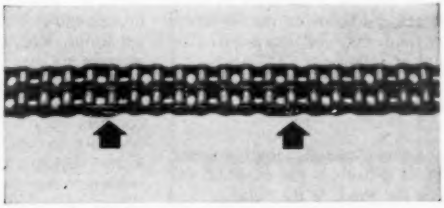
WITH IMPROVED BALDWIN ASSEMBLY RIVETED ROLLER CHAIN

When it comes to assembly, disassembly or repair of roller chain either at the rig or in the supply store, the improved Baldwin Assembly is your time-saving, money-saving, trouble-saving, temper-saving answer. There's virtually nothing to it. Here's all you do:

TO TAKE THE CHAIN APART

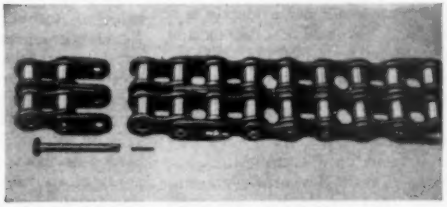


1 You buy Baldwin Assembly Chains in a packaged unit —a 10-foot strand in every box. Each chain is made up of sections of varying lengths joined by single coupler pins. Stretch the assembled chain out on the bench or the floor.



2 Locate and mark the coupler or couplers to be disconnected. Their distinctive straight edge side plates, locking pins and washer heads make them easy to locate.

3 Remove locking pin and drive flatted end of the coupler pin out of its side plate. Then tap it out the rest of the way with a drift pin. Before driving out the pin, back up the opposite side of chain with hammer or vise grip pliers to avoid springing the side plates.



4 That's how easy it is to take this chain apart. If a section you need is in the middle of the strand . . . just remove the coupler pin on either side of the section desired.

TO REASSEMBLE THE CHAIN. To couple this chain, just line up the free end of the coupler link with the adjacent roller link. Back up the link with hammer or vise grip pliers. Drive in the pin (being sure the flatted end seats properly in the flatted side plate hole). Insert the locking pin, and the chain is now reassembled.

BALDWIN-REX ROLLER CHAINS

A PRODUCT OF

Chain Belt COMPANY *OF MILWAUKEE*

It will pay you to investigate the Improved Baldwin Assembly. You'll find it will simplify your chain problems and save you real money. Ask about it at your supply store or use the coupon to send for Bulletin 52-3. Baldwin-Rex Oil Field Sales Offices located in New York • Tulsa • Dallas • Houston • Midland • Los Angeles.

Chain Belt Company 52-413
4619 W. Greenfield Ave.
Milwaukee 1, Wis.
Please send me Bulletin 52-3.

Name.....

Company.....

Address.....

City.....State.....

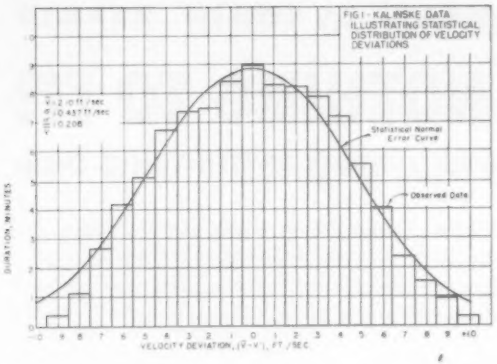


FIG 1 - KALINSKE DATA ILLUSTRATING STATISTICAL DISTRIBUTION OF VELOCITY DEVIATIONS
Statistical Normal Error Curve
Observed Data
DURATION, MINUTES
VELOCITY DEVIATION, (V-V), FT./SEC.

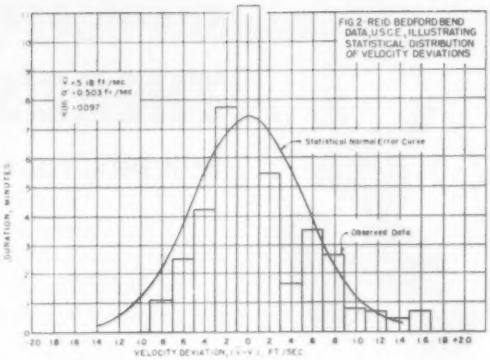


FIG 2 REID BEDFORD BEND DATA, U.S.C.E., ILLUSTRATING STATISTICAL DISTRIBUTION OF VELOCITY DEVIATIONS
Statistical Normal Error Curve
Observed Data
DURATION, MINUTES
VELOCITY DEVIATION, (V-V), FT./SEC.

tance of inertia forces and viscous forces in the moving fluid. The measure of the relative importance of these two forces is known as the Reynolds number and may be expressed algebraically as follows:

$$Re = \frac{\rho LV}{\mu}$$

in which Re is the Reynolds number, ρ the fluid density, μ the dynamic viscosity of the fluid, V the velocity, and L some length parameter characteristic of the flow. In pipes L is normally taken to be the diameter, D, and in open channels L is normally taken to be the mean depth, D.

The Reynolds number evidently represents the ratio between the inertial and viscous properties of fluid flow.

There has now been adequate experimental evidence to justify acceptance of the fact that any single Reynolds number denotes a very particular state of turbulence.

For many years Reynolds' work was neglected and practicing engineers worked largely from purely empirical formulas. Since about 1930, fundamental research, spurred largely by the requirements for aeronautical design, has brought to light many important features of fluid turbulence permitting a clearer and more detailed understanding of many hydraulic phenomena.

The turbulence observed in the Reynolds apparatus, or in smoke from a chimney, or in natural streams, is seen to be a most haphazard mixing process. Many small eddies and vortexes are apparent whirling from one fluid layer to the other.

Since the pressure differentials which cause loads on underwater pipe lines are caused by velocity variations it is necessary to approach the determination of the loads by analysis of the behavior of the velocities.

The large boils, eddies, and vortexes observed in a natural stream may appear to have little relation to the minute eddies observed in the Reynolds apparatus. Basically, however, the two phenomena are the same. Superimposed on the general downstream movement of the flowing mass there is a complex internal agitation of the fluid resulting in continually changing velocity vectors. However, a study of readings taken at intervals over a sufficient period of time will reveal that a mean velocity exists during the period. This mean velocity is referred to as the temporal mean velocity, or the mean velocity with respect to time.

In order to analyze the characteristics of turbulent flow it has been found convenient to utilize the temporal mean velocity at a given point together with an expression for the instantaneous velocity variation from that mean. Then the instantaneous velocity, **V**, at any point may be regarded as the vector sum of the temporal mean velocity, **V**, and the instantaneous fluctuation, **V'**:

$$\mathbf{V} = \mathbf{V} + \mathbf{V'}$$

$$V_x = V_x + V_x' \quad V_y = V_y + V_y' \quad V_z = V_z + V_z'$$

The subscripts x, y, and z in the foregoing equations refer to the three coordinate directions.

Due to the purely random distribution of velocity fluctuations at any given point in turbulent flow, curves plotted from data obtained at a given point by measurement of velocities at frequent intervals over a sufficient period of time with the number of times which each velocity magnitude is recorded as ordinates and the value of the corresponding velocities as abscissas show a remarkable degree of correlation with the statistical "normal error law." Kalinske illustrated this correlation through use of a standard price current meter.* In Kalinske's investigation a continuous record of the time interval between each current meter revolution was kept for a period of 10 minutes. The resulting data were statistically analyzed to determine the standard deviation and the temporal mean. These values determined the shape of the normal error curve, which was then compared to the plotted distribution of the original data. This curve with the plotted data superimposed thereon is shown in Fig. 1. The data Kalinske used were obtained by the Rock Island district, Corps of Engineers, U. S. Army, during a series of measurements on the Mississippi River above Cairo, Ill.

The only available measurements of like character on the lower Mississippi River were made by personnel of the Potamology Section of the Waterways Experiment Station at Vicksburg, Miss. These data were obtained in connection with a study of the possible effect of turbulence on a revetment failure at Reid Bedford Bend on the Mississippi River a few miles below Vicksburg. A continuous record was kept of the time interval between five current meter revolutions over a period of about 1 hour. A plot typical of these data is shown on Fig. 2.

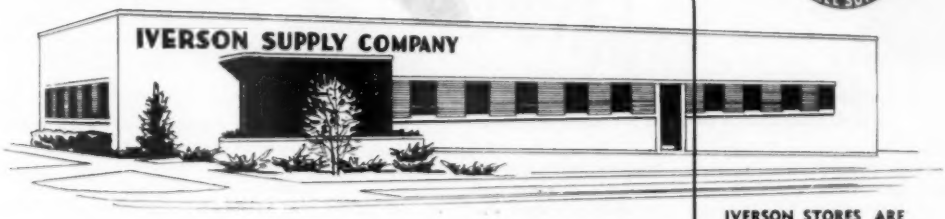
The two peaks and the skewness apparent in Fig. 2 seem to indicate some cyclic variations in the velocity fluctuations. Such cyclic variations are not characteristic of true turbulence. In this particular instance the readings were taken fairly close to the bank in the vicinity of a large stationary eddy which is believed to account for the indicated cycles.

The normal error law for velocity

*Kalinske, A. A., "The Role of Turbulence in River Hydraulics," Proceedings of the Second Hydraulics Conference, University of Iowa, 1942.

THIS IS IVERSON TERRITORY

IVERSON SUPPLY CO. OIL WELL SUPPLIES



IVERSON STORES ARE LOCATED AT:

Salem, Illinois; Oklahoma City, Okmulgee and Tulsa, Oklahoma; Kermit, Odessa and Snyder, Texas; and Artesia and Farmington, New Mexico.

You will find IVERSON Stores in a great triangle from Salem, Illinois, to Kermit, Texas, and to Farmington, New Mexico—covering the rich Midwest to Southwest Oil Fields.

If you operate in this area, we cordially invite you to visit our nearest store. Each store carries the stocks most popular in that area. We want to serve you and we will appreciate your business. Call on us for a sample of IVERSON SERVICE.

OFFICES: FORT WORTH TEXAS

IVERSON SUPPLY COMPANY

DRILLING-PRODUCTION AND REFINERY EQUIPMENT

P.O. BOX 1439 TULSA 1, OKLA.

OFFICES: MIDLAND TEXAS

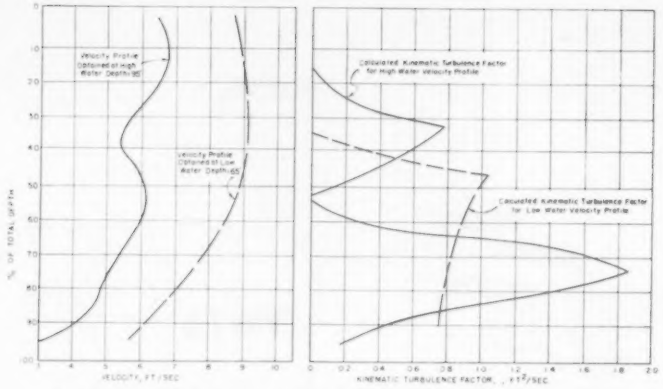

% OF TOTAL DEPTH
Velocity Profile Obtained at High Water Depth-65'
Velocity Profile Obtained at Low Water Depth-45'
VELOCITY, FT/SEC
Calculated Kinematic Turbulence Factor for High Water Velocity Profile
Calculated Kinematic Turbulence Factor for Low Water Velocity Profile
KINEMATIC TURBULENCE FACTOR, ε FT²/SEC

Fig. 3—Illustrative plots of the variation of turbulence along a velocity profile.

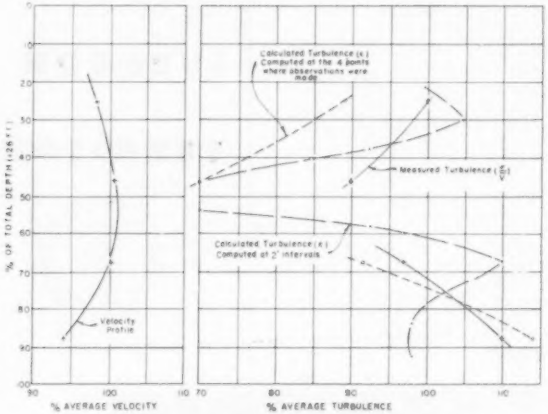

% OF TOTAL DEPTH (=26 FT.)
Calculated Turbulence (ε) Computed at the 4 points where observations were made
Measured Turbulence ($\frac{dv}{dy}$)
Calculated Turbulence (ε) Computed at 2' intervals
Velocity Profile
% AVERAGE VELOCITY
% AVERAGE TURBULENCE

Fig. 4—Comparison of calculated and measured turbulence.

variations in turbulent flow may be expressed algebraically as follows:

$$f(V - \mathbf{V}) = \frac{1}{\sigma (2\pi)^{1/2}} e^{-\frac{(V - \mathbf{V})^2}{2\sigma^2}} \quad (1)$$

in which $\mathbf{V}$ is the temporal mean velocity, V is the instantaneous velocity, σ is the standard deviation, and e is the base of natural logarithms. The function $f(V - \mathbf{V})$ is the frequency of occurrence of values of velocity between $(V - \mathbf{V})$ and $(V - \mathbf{V}) + d(V - \mathbf{V})$. Turbulence intensities are conventionally expressed as the ratio of the standard deviation, σ, to the temporal mean velocity, $\mathbf{V}$.

Equation 1 has quite limited application. Continuous current meter records over a considerable period of time are necessary to determine the value of the temporal mean velocity, $\mathbf{V}$, and the standard deviation, σ. The statistical analysis required to compute the temporal mean and the standard deviation also becomes quite tedious.

Another method which may be used for the comparison of turbulence intensities is based upon the evaluation of the kinematic turbulence factor. It may be shown that the total shear at any point in a turbulent fluid is dependent upon the viscous shear, $\mu\,(dv/dy)$, and the momentum transfer normal to the direction of flow under consideration, $-\rho\,\mathbf{V}_x'\mathbf{V}_y'$:

$$\tau = \mu\,(dv/dy) - \rho\,\mathbf{V}_x'\mathbf{V}_y' \quad (2)$$

in which τ is the shearing stress, ρ the fluid density, μ the dynamic viscosity, x and y the coordinate directions, v the instantaneous velocity, and V′ the instantaneous fluctuation. For highly turbulent flows the viscous forces may be ignored and Equation 2 written as follows:

$$\tau = -\rho\,\mathbf{V}_x'\mathbf{V}_y' \quad (3)$$

Prandtl introduced the concept of a mixing length, l, which theoretically represents the average distance over which a mass of fluid is carried by turbulent momentum transport before its identity is lost in the surrounding flow. Particles coming from regions of high velocity to regions of low velocity will contribute positive amounts to the velocity components in the x direction; and for particles moving from regions of low velocities into regions of high velocities the reverse is true. Since the mixing length, l, is the distance perpendicular to the main flow covered by the particle it appears justifiable to regard the velocity fluctuation, V_x', as proportional to the difference in mean velocity at the beginning and end of the particle path, l. That is:

$$|V_x'| = l\,(dv_x/dy) \quad (4)$$

The vertical bars denote absolute magnitude. Due to the correlation which exists between the velocity fluctuations V_x' and V_y', Equation 4 may be combined with Equation 3 to give the following expression:

$$\tau = a\,\rho\,|\mathbf{V}_y'|\,l\,(dv_x/dy) \quad (5)$$

in which a is a numerical coefficient introduced as a measure of the correlation between the velocity component and $|\mathbf{V}_y'|$ is the average absolute amount of the fluctuation perpendicular to the flow. Then, if ϵ is set equal to $a\,|\mathbf{V}_y'|\,l$, Equation 5 may be written as follows:

$$\tau = \rho\,\epsilon\,(dv_x/dy) \quad (6)$$

The factor ϵ (epsilon) is the kinematic turbulence factor. It has been variously called the "eddy viscosity," "eddy conductivity," "mechanical viscosity," and "Austasch coefficient. The term kinematic turbulence factor is believed to best describe the function which it represents.

Equation 6 may be combined with the expression for shear at any point in an open channel ($\tau = \gamma ys$) to yield the following expression:

$$\epsilon = \frac{(gys/dv_x)}{dy} \quad (7)$$

in which g is the acceleration due to gravity, y is the distance from the filament of maximum velocity to the point under study measured along the y axis, and s is the water surface slope. Equation 7 may be used to evaluate ϵ at any point in a stream where velocity profiles are available.

It may be seen from Equation 7

You could know the plant . . . 20 years of steady growth . . . 20 years of work, brains and money . . . then in 20 minutes a little fire got away and reduced it all to nothing.

But, your larger size fire hazards can be protected very efficiently at a reasonable cost, thanks to C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area . . . to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Flexibility is the keynote with these C-O-TWO Fire Extinguishing Systems . . . the low pressure carbon dioxide storage tanks range in capacities from one to fifty tons . . . discharge facilities can either be manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs. Future plant expansion is easily and economically provided for by initially installing an oversized low pressure carbon dioxide storage tank and adding the supplementary discharge facilities at a later date.

Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

FOR FAST, DEPENDABLE SERVICE ON OIL FIELD EQUIPMENT AND SUPPLIES

Whatever your needs are in oilfield supplies
There's one place to get them without useless tries,
Just contact the nearest of our numerous stores
For—midday or midnight—we ne'er "close our doors."

From rig tip to drill bit, betwixt and between,
We carry each item of which drillers dream,
And when down-time's your headache just give us a try;
When Speed can mean Dollars It's "UNITED SUPPLY."

Uncle Sandy Says: *There's more truth than poetry in this!*

COURTESY · SERVICE · DEPENDABILITY

UNITED SUPPLY

AND *Manufacturing* COMPANY

TULSA, OKLAHOMA

Stores in KANSAS, OKLAHOMA, TEXAS, LOUISIANA AND NEW MEXICO

that the intensity of turbulence in any given stream perpendicular will vary directly with the distance of the point from the filament of maximum velocity and inversely with the velocity gradient. Plots illustrating the variation in intensities of turbulent action for various velocity profiles are illustrated in Figs. 3 and 4. Calculated turbulence intensities, as given by the kinematic turbulence factor, are compared with measured turbulence intensities computed from continuous current meter readings in Fig. 4. In general, it may be said that the intensity of turbulence increases with the distance from the filament of maximum velocity and has its maximum value near the bottom of the stream.

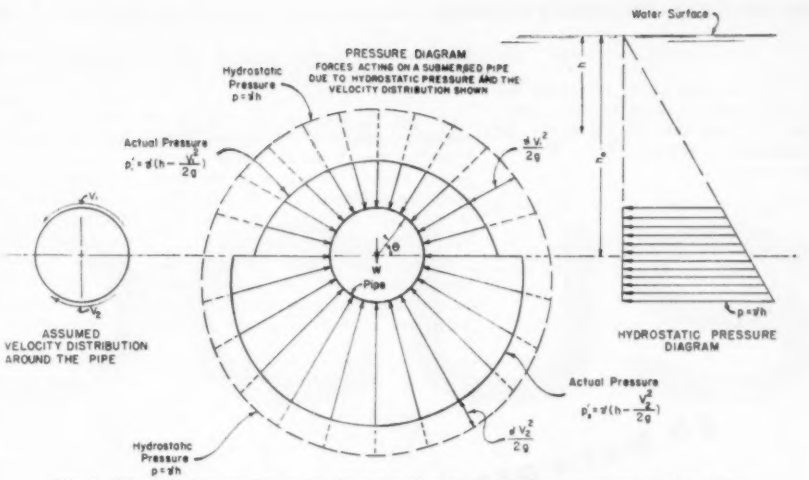

PRESSURE DIAGRAM
FORCES ACTING ON A SUBMERGED PIPE DUE TO HYDROSTATIC PRESSURE AND THE VELOCITY DISTRIBUTION SHOWN
Water Surface
Hydrostatic Pressure p = γh
Actual Pressure p' = γ(h − V²/2g)
Pipe
ASSUMED VELOCITY DISTRIBUTION AROUND THE PIPE
HYDROSTATIC PRESSURE DIAGRAM
Actual Pressure
Hydrostatic Pressure p = γh

Fig. 5—Schematic diagram illustrating the effect of velocity deviations on pressure against a pipe.

Equation 7 may be correctly applied only to velocity gradients which are taken along a "y" axis intersecting the isovels of the whole stream cross-section at right angles. If the "y" axis is selected so as to intersect all isovels in the stream cross-section at right angles the effects of turbulent momentum transfer in the "z" direction, that is, parallel to the isovels, are canceled.

Pressure Variations Resulting from Turbulent Velocity Fluctuations

Turbulent velocity fluctuations result in high local velocity variations. These local velocity variations result in local pressure differentials of considerable magnitude and of varying duration.

The effect of local velocity variations may be illustrated by referring to the idealized schematic diagram shown in Fig. 5. It has been assumed for illustrative purposes that the instantaneous circumferential velocity around the upper half of the pipe is uniform at V_1 while the instantaneous circumferential velocity around the lower half of the pipe is uniform at V_2.

The pressure in feet of water acting normal to the pipe wall at any point is equal to the static head, h, less the velocity head, $V^2/2g$. The actual head against the pipe at any point is then $[h - (V^2/2g)]$, or the pressure in pounds per square foot is:

$$p' = \gamma\,[h - (V^2/2g)] \qquad (8)$$

in which γ is the unit weight of water.

If the center of the pipe is taken as the origin for polar coordinates, and r and Θ are measured as shown in Fig. 5, it may be seen that the unit pressure in the vertical direction is $p' \sin \Theta$. The total upward force per unit length of pipe is then:

$$F_u = \int_{\pi}^{2\pi} (p_2' \sin \Theta)\, r\, d\Theta \qquad (9)$$

Substituting for p_2':

$$F_u = \int_{\pi}^{2\pi} \gamma\,[h - (V_2^2/2g)] \sin \Theta\, r\, d\Theta \qquad (10)$$

It may also be seen from Fig. 2 that $h = h_o - r \sin \Theta$. Then:

$$F_u = \int_{\pi}^{2\pi} \gamma\,[(h_o - r \sin \Theta) - (V_2^2/2g)] \sin \Theta\, r\, d\Theta \qquad (11)$$

and, similarly, the downward force:

$$F_d = \int_{0}^{\pi} \gamma\,[(h_o' - r \sin \Theta) - (V_1^2/2g)] \sin \Theta\, r\, d\Theta - W \qquad (12)$$

in which W is the weight of the pipe per unit length.

Integrating, it is found that:

$$F_u = \gamma\,[h_o - (V_2^2/2g)]\, 2r + [\gamma\,(\pi r^2/2)] \qquad (13)$$

$$F_d = \gamma\,[-h_o + (V_1^2/2g)]\, 2r + [\gamma\,(\pi r^2/2)] - W \qquad (14)$$

Combining Equations 13 and 14, it may be seen that:

$$F_r = F_u + F_d = \gamma\,[(V_1^2/2g) - (V_2^2/2g)]\, 2r + \gamma\,\pi r^2 - W \qquad (15)$$

in which the positive direction is upward.

An examination of Equation 15 shows that the vertical force acting on a pipe under the assumed conditions illustrated in Fig. 5 is dependent upon the horizontal projection of the pipe diameter, 2r, the buoyancy, or water displacement $= (\gamma\,\pi r^2)$, of the pipe per unit length, its weight per unit length, W, and the relative velocity on the upper and lower halves of the pipe. The depth to which the pipe is submerged has not effect on the vertical forces if it is assumed that there is no change in the unit weight of the surrounding fluid with depth.

If it is assumed that velocity deviations may occur in turbulent flow so that the velocity on the upper and lower halves of the pipe may be compared to velocity deviations at a point in the turbulent fluid, the vertical force resulting from velocity deviations, F_t, may be expressed by the term:

$$\gamma\,(V_1^2/2g) - (V_2^2/2g)\, 2r$$

The unit pressure in a vertical direction resulting from turbulent velocity deviations, p_v, may be set equal to $F_t/2r$. Then:

$$p_t = \gamma (V_1^2/2g) - (V_2^2/2g) \quad (16)$$

If it is assumed at V_x represents the temporal mean velocity in the x direction, $\mathbf{V_x}$, and that V_1 represents the instantaneous velocity, $\mathbf{V_x} + \mathbf{V_x'}$, we may write:

$$p_t = \gamma/2g\ [(V_x + V_x')^2 - V_x^2] \quad (17)$$

$$p_t = (\gamma V_x^2/2g)$$

$$\times [(2V_x'/V_x) + (V_x'^2/V_x^2)] \quad (17A)$$

Letting

$$\beta = (2V_x'/V_x) + (V_x'^2/V_x^2)$$

Then

$$p_t = \beta \gamma (V_x^2/2g) \quad (18)$$

It may be seen that β will be a numerical coefficient dependent solely upon the ratio of the instantaneous turbulent velocity deviation to the temporal mean velocity, V_x'/V_x, and that it may act in either direction (i.e., up or down).

Equation 18 requires the determination of the ratio V_x'/V_x before it may be evaluated and is thus subject to the limitations already discussed for the statistical evaluation of fluid turbulence. Reasonable values for design may be derived from the turbulence velocity fluctuations measured by Kalinske, and others, however.*

A series of continuous velocity measurements at nine locations on the Mississippi River between Cairo, Ill., and Dubuque, Iowa, conducted by Kalinske in cooperation with the Rock Island district, Corps of Engineers, revealed that the ratio of the root mean square of the velocity deviations to the mean velocity, σ/V_x, varied from 0.059 to 0.236. The root mean square of the velocity deviations, σ, is a measure of the magnitude of the velocity deviations which occurred during the test period. Its ratio to the temporal mean velocity, V_x, is thus a measure of the "intensity" of turbulence as determined by the magnitude of the velocity deviations and of the temporal mean velocity. The maximum ratios of σ/V_x, or the turbulence intensities, were found to be near the bottom at each location investigated. The readings taken within 1.5 ft. of the bottom revealed a σ/V_x ratio varying from 0.127 to 0.236.

Laboratory investigations have shown values of σ/V_x as high as 0.333 in regions near the flow boundary.

Accordingly, an assumption that σ/V_x will attain values of about 0.30 in the flow regions immediately adjacent to the bottom is believed to best agree with currently available data.

Turbulent velocity fluctuations have been shown to conform reasonably well with the normal error law, which requires that deviations exceeding the mean prevail about one-third of the time. Another general rule evolved from the statistical normal error curve is that the maximum deviations are about three times the mean deviation. All this would indicate that the maximum velocity deviation ratio, V_x' max./V_x, could be approximated by assuming V' max. equal to three times the standard velocity deviation, σ, which will have a maximum value of about 30 per cent. The resultant maximum velocity deviation ratio, V_x' max./V_x, would thus approach unity, and ratios of from 0.5 to 0.75 should be of frequent occurrence.

Table 1 assumed values of V and V' are used to illustrate the magnitude of the pressure differences which might logically be expected under conditions of turbulent flow.

It is quite evident from the fore-

*Report of the First Potamology Conference with Hydraulic Consultants, U. S. Waterways Experiment Station, Vicksburg, Miss., 1948.

AND IN YOUR BUSINESS . . .

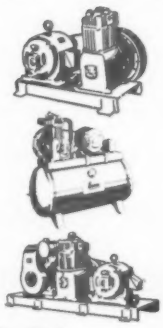
Quincy COMPRESSORS

When it comes to DEPENDABLE COMPRESSED AIR SUPPLY, Quincy Compressors can be as important as the mountain climber's lifeline. Quincy builds a complete line of modern, compact, rugged compressors in sizes from 1 to 90 c.f.m.

There's a Quincy Compressor for *your* job! Depend on a Quincy specialist to help you select the type and size to meet your specific needs.

FREE! NEW CATALOG

Complete with illustrations, features and specifications of entire Quincy line. Write Dept. OG-7.

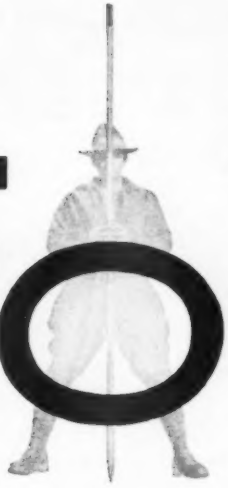


QUINCY COMPRESSOR CO.

QUINCY, ILLINOIS

Branch Offices: NEW YORK PHILADELPHIA DETROIT CHICAGO ST. LOUIS DALLAS SAN FRANCISCO

Manufacturers of Air Compressors Exclusively



To keep your

pipe protection costs in

focus

keep **BARRETT** in the picture all the way!

Pipe protection costs are partly determined *before* your pipe line gets out of the blueprint stage. That's why it is so important to get the advice of Barrett Technical Service when you *start* planning your job—to help you select the right pipe coatings to insure maximum pipe protection at minimum cost.

Your Barrett Serviceman will help you *in the field*, too. You'll find his long experience extremely useful. He'll inform you about money-saving techniques, and give you the answer to many special problems that may arise. And remember—every Barrett man has the benefit of Barrett's long experience, as well as his own.

It will pay you in every way to call Barrett *first*.

Send for Barrett's Field Manual—it contains detailed procedures for application of pipe coatings. The only guide of its kind, it will give you a handy source of reference data. It is yours for the asking.

BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

*Reg. U. S. Pat. Off.

In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Quebec

going derivations that the values shown in Table 1 represent the pressure deviations which may be expected to result solely from turbulent velocity fluctuations. Loads due to drag must be superimposed on these values to obtain the "design load."

Application to Pipe-Line-Crossing Design

The simplified sketches presented in Fig. 5 illustrate the nature of the loadings resulting from turbulent velocity fluctuations.

The most significant simplification introduced in Fig. 5 is the assumption of circumferential velocities that maintain a constant value around one-half of the pipe. Actually, the flow pattern around the pipe is such that this assumption does not accurately represent actual conditions. The loads presented in Table 1 may thus not be most accurately applied to the total horizontal projected area of the pipe and should, instead, be applied to a certain percentage of the horizontal projected area. The proportion of the horizontal area affected will depend upon several factors, such as velocity, exposure of the pipe, and the size of the pipe. Application of the loads tabulated in Table 1 to only one-half of the projected horizontal area of the pipe serves to indicate the magnitude of the loads which may be reasonably anticipated if a river crossing pipe becomes exposed to the current, however.

TABLE 1
Momentary Pressure Differences Resulting From Assumed Mean Velocities and Velocity Deviations

Temporal mean velocity V_x (ft. per sec.)	Velocity deviation V_x' (ft. per sec.)	V_x'/V_x	β	Pressure deviation p_x (lb./sq. ft.)
4	2	.5	1.25	19.4
4	3	.75	2.06	32.0
4	4	1.0	3.00	46.6
6	3	.5	1.25	43.7
6	4.5	.75	2.06	72.0
6	6	1.0	3.00	105.0
8	4	.5	1.25	77.5
8	6	.75	2.06	128
8	8	1.0	3.00	186
10	5	.5	1.25	121
10	7.5	.75	2.06	200
10	10	1.0	3.00	291

Another feature which must be considered in applying these loads to the design of river crossing pipe is that, as yet, there are no data available which indicate the areal extent over which a given velocity fluctuation extends. That is, there are no data to form a basis for an estimate of the length of pipe affected by any given velocity deviation.

The effect of turbulent velocity deviations may be illustrated by considering a pipe partially exposed above the bed. The buried portion of the pipe will be subject to essentially hydrostatic pressure, while the top of the pipe will be subject to a pressure less than hydrostatic, and one which will be continually varying as the result of velocity fluctuations.

The pressure variations on the top of the pipe resulting from velocity fluctuations will be of short duration and the length of the pipe affected simultaneously by variations at a point will probably be rather small. It is possible that pressure variations of varying but sufficient magnitude to permit pipe uplift may extend over a relatively long length of pipe. Repeated stresses in the pipe resulting from uplift over even a short length may cause fatigue and rupture of the metal.

An example of the effect upon submerged structures which pressure variations resulting from turbulence may cause is offered by observations which have been made on articulated concrete

In the American Tradition

PRESERVE YOUR FREEDOM!

"Land of the Free . . ."

When we sing that in our National Anthem, what do we mean?

Free hand-outs of the kind of bogus security promised by state socialism in exchange for government regulation and dictatorial control over our lives and economic fortunes?

It could be!

But to Americans who love their country it means FREEdom of thought; FREEdom of expression; FREEdom of initiative—the priceless FREEdom guaranteed by an inviolable Constitution under which we have developed and prospered individually and collectively above all other peoples on earth.

Something to sing about? You bet it is!

Let's keep it that way!

USE SPANG Weldless Jars for
- Minimum footage costs
- Minimum fishing time loss
- Maximum strength, safety, durability, economy

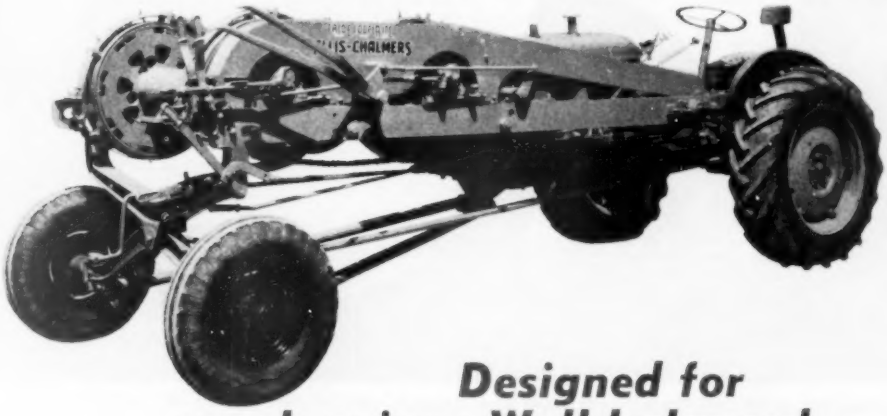
The HIGHER STANDARD
SPANG CABLE TOOLS made by SPANG & CO. BUTLER, PA.
for
OIL WELLS • GAS WELLS • ARTESIAN WELLS
SHOT BLAST HOLES • PROSPECT DRILLING

SPECIFY SPANG—FOR SALE BY DEALERS EVERYWHERE

FRED E. COOPER INC. TULSA
DRAW WORKS
SPUDDERS
WINCHES
POWER UNITS

Model W-201 Tractors

A Low Cost, Complete Pulling Outfit for Wells to 3000'



Designed for rough going—Well balanced—Highly maneuverable—Fast.

These units have extremely high axle clearance—yet low center of gravity, essential to safe operation in hilly country. When equipped with dual rear and mud front tires, these units will operate in the worst conditions of mud and sand. Single or double drum units. Jerk Line Spudder or Rotary Drive for clean-out, and Telescoping Masts are available. Seat Controls (standard equipment). Additional equipment: Front Controls, Metal Cabs, Catheads.

Brakes—Two—26" dia. x 5" wide
Drum Capacity—3300' of ⅝" line
Line Speeds—8 from 52' to 866' p.m.
Maximum Line Pull—16,750 lbs. at 52' p.m.
Road Speeds to 15 m.p.h.

Regardless of the depth of wells, there is a Cooper—Allis-Chalmers Winch of the right capacity to do the job economically.

FRED E. Cooper, Inc.
P. O. Box 1890 TULSA, OKLA.
Houston, Odessa, Los Angeles

A STABLE ARC, GOOD DIRECTIONAL CONTROL, AND WIDE USEABILITY CHARACTERISTICS ENABLE YOU TO . . .

Weld Stainless Easily in ALL Positions with G-E Stainless Steel Electrodes

36 TYPES ASSURE YOU OF THE RIGHT ELECTRODE FOR EVERY JOB

You get the most for your dollar when you buy General Electric stainless steel electrodes. Here are seven reasons why:

1. You get excellent handling characteristics in *all positions.*
2. You get good directional control because G-E stainless steel electrodes give you a very stable arc.
3. You get the minimum of spatter and can remove slag easily.
4. You can select the correct electrode for every application because G.E. offers industry a complete line of chrome and chrome-nickel types.
5. You can get G-E stainless steel lime-coated electrodes for reverse polarity DC and titania-coated rods for AC and reverse polarity DC.
6. You get the correct metallurgical deposit your specific job requires.
7. You get excellent physical properties in the bead itself.

See Your G-E Welding Distributor!

He can help you select the best, most economical electrode for your specific stainless steel welding job.

Your G-E welding distributor also carries a complete line of other electrodes, accessories, AC, DC, Inert-Arc and Atomic Hydrogen welders. You can find his name by looking for General Electric under "Welding Equipment" in the classified pages of your telephone directory. *General Electric Co., Schenectady 5, N. Y.*

712-19

SMOOTH, NEAT WELD made with lime type W-1310, reverse polarity DC electrode.

VERTICAL FILLET weld made with W-2310, titania type, AC or DC reverse polarity.

GENERAL ELECTRIC

mat revetments. Under certain conditions the toe of the revetment has been observed to lift from the stream bottom and remain more or less suspended, even though the individual pressure variations are essentially local in nature.

Velocities encountered near the bottom of a natural stream are less than the mean velocity on any vertical. A pipe line lying on the stream bottom will constitute an obstruction giving rise to high local velocities, however, and these velocities must be considered in estimating the effects of turbulence.

Average velocities in the Mississippi River vary with the portion of the river under consideration as well as with the stage and local conditions in the cross-section. For example, the observed mean velocity in the entire cross-section of the Mississippi River at the Memphis discharge range varied from 1.85 to 9.24 ft. per second in 1950. During the same period the mean velocity at the Baton Rouge discharge range varied from 2.10 to 6.53 ft. per second.

These mean velocities, representing the average velocity for the entire cross-section, are accompanied by maximum temporal mean velocities which may be as much as one and one-half to two times the mean cross-sectional velocity.

It is reasonable to expect that, if an underwater river-crossing pipe becomes exposed as the result of scour, it will be exposed in a region of high current velocities. The fact that exposure may be expected in regions of high velocity, together with the fact that the pipe will cause even higher local velocities, indicate that, if a pipe is exposed, it may be required to withstand velocities higher than the mean cross-sectional velocity. Although data concerning local velocities in the vicinity of an exposed pipe are also unavailable, it is the writer's belief that a reasonably conservative design velocity may be obtained, in most instances, by assuming the velocity at the exposed pipe equal to one and one-half times the mean cross-sectional velocity. This, in effect, would mean that a pipe-line crossing in the vicinity of Baton Rouge, for resistance to turbulent action alone, should be capable of resisting a temporal mean velocity of about 10 ft. per second with an accompanying pressure deviation on the order of 300 lb. per sq. ft. if it was to be maintained during exposure above the bottom at high river stages.

The pressure resulting from turbulence may be in an upward direction and will be resisted by the effective weight of the pipe line in water and by beam action over the affected span length. The magnitude of this force is such that its action over even a relatively short distance would be sufficient to lift the pipe into the current.

It should be noted that the uplift described above is not a steady load. It will vary with the instantaneous fluctuations in the current so that the pipe may be repeatedly lifted and dropped. Even if the pipe is not lifted from its bed, flexural stresses of a fatiguing nature will result from uplift.

Once the pipe has been lifted from its bed, or totally exposed by erosion, it will be subject to the additional hydrodynamic load of drag. Drag will act parallel to the current for certain pipe sizes and certain velocities. At certain velocities the pipe may be subject to the phenomenon of flutter.

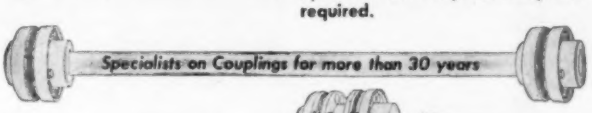
Flutter results from the fact that at certain Reynolds numbers vortexes are formed in the wake of a submerged body which "make" and "break" on altering sides of the wake. Their effect is to retard the flow velocity on one side of the body, and thus increase the pressure, while the velocity is increased and the pressure reduced on the op-

THOMAS Flexible ALL METAL COUPLINGS

FOR POWER TRANSMISSION • REQUIRE NO MAINTENANCE

REFINERS! PIPE LINE MEN! DRILLING ENGINEERS! LABORATORY TECHNICIANS!

All can use Thomas Couplings to their advantage on Pumps, Compressors, Cooling Towers, Rigs or any tough job where continuous operation and dependability are required.



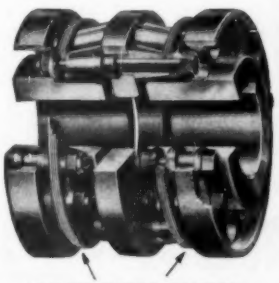
Specialists on Couplings for more than 30 years

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated

Lubrication is not required!



PATENTED FLEXIBLE DISC RINGS

THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

• • •

NO MAINTENANCE PROBLEMS.

• • •

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

For DEPENDABILITY IN TRANSPORTATION

The Correct Fastener for the Job

These Erie bolts have at least one thing in common—they are designed to hold against maximum strains imposed by pressure, temperature, or corrosion. They differ in material, shape and threading as the job directs. For 38 years, we have geared our plant to manufacture these unusual high quality bolts to exacting specifications.

This broad experience backed by a high desire to be of service to you is your assurance that Erie is ready to meet your special bolting requirements.

A SUBSIDIARY OF Barium STEEL CORPORATION Steelmanship in the Service

ERIE BOLT and NUT CO.
ERIE • PENNSYLVANIA

STUDS • BOLTS • NUTS
ALLOYS • STAINLESS
CARBON • BRONZE

Representatives in Principal Cities.

posite side. The pipe would thus be subject to alternating vertical forces, first upward and then downward. Values of these vertical forces equal to as much as 40 per cent of the horizontal drag have been measured. These vertical forces will have a definite period for any given set of conditions. If this period is in resonance with the frequency of the exposed pipe section, consantly increasing deflections may result until the pipe ruptures.

It should also be noted that stresses arising from flutter or a tendency to flutter are longitudinal flexural stresses which will continually reverse their direction. The stresses arising from this load are therefore additional fatiguing stresses.

Drag is a comparatively simple and familiar load resulting in a horizontal force applied to the exposed pipe. Forces resulting from drag will also vary with instantaneous velocity fluctuations, and may thus tend to induce vibration or flutter in the horizontal plane.

The horizontal load resulting from drag will quite commonly have values of 250 lb. per linear foot of 24-in. o.d. pipe for temporal mean velocities of 10 ft. per second. Instantaneous velocity fluctuations may more than double this horizontal force.

Selected Bibliography

Bakhmeteff, B. A., Mechanics of Turbulent Flow, Princeton University Press, 1936.

Higgs, J. W., Jr., An Analysis of Flow Around River Bends, Masters Thesis, School of Hydraulic Engineering, Louisiana State University and Agricultural and Mechanical College, Baton Rouge, La., Aug. 1949.

Kalinske, A. A., "Relation of the Statistical Theory of Turbulence to Hydraulics," Transactions, American Society of Civil Engineers, Vol. 105, 1940, pp. 1547-1600.

Kalinske, A. A., "The Role of Turbulence in River Hydraulics," Proceedings of the Second Hydraulics Conference, Bulletin 27, No. 400, University of Iowa, June 1-4, 1942.

Leighly, J. B., "Toward a Theory of the Morphologic Significance of Turbulence in the Flow of Water in Streams," Publications in Geography, University of California, Vol. 6, No. 1, 1932.

Rouse, Hunter, "Modern Conceptions of the Mechanics of Fluid Turbulence," Transaction, American Society of Civil Engineers, Vol. 102, 1937, pp. 463-543.

Rouse, Hunter, Fluid Mechanics and Hydraulic Engineers, McGraw-Hill Book Co. Inc., New York and London, 1938.

Correction

The author of the article, "Oil Recovery by L.P.G. Injection," which appeared in the June 30 issue of the Journal, has called attention to an error in his manuscript. Equation 2 should have read

$$R = X$$

instead of $R = 1/(1-X)$

Sky high in quality . . .

No other ball and seat gives the long valve service you'll get from Kennametal. It is the "vacuum-sintered" high quality cemented carbide made by an exclusive method which assures greater resistance to wear, greater strength and standard uniformity. It's much harder than steel, is corrosive resistant, non-magnetic, and outlasts alloy steel 20 to 1. Kennametal Balls and Seats offer maximum resistance to corrosion and pitting even under the most severe fluid pumping conditions. Because of these special qualities, you don't pull a pump because of valves when it is equipped with the Kennametal API Ball and Seat. One Texas oil producer reports, ". . . Kennametal Balls and Seats in my well had lasted 22.5 times as long as alloy steel balls—when first inspected . . . and even then showed no sign of wear." The Kennametal Ball and Seat had been in service for 448 days! The best service record of other balls and seats was only 20 days.

You will get better and longer service too—the Kennametal valve check "puts an end to down-the-hole check valve trouble," saves costly string pulls and production losses. It is precision ground and polished to stand an initial vacuum of 25 inches—5 inches above standard practice. Seats are available in both plain and rib type. Get high quality Kennametal Balls and Seats from your supply store or pump manufacturer today. Accept no substitute for *high quality* Kennametal Balls and Seats.

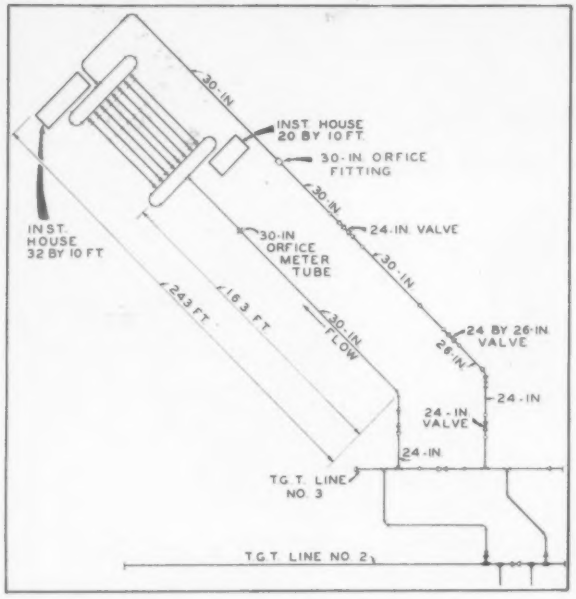
Kennametal

Balls and Seats

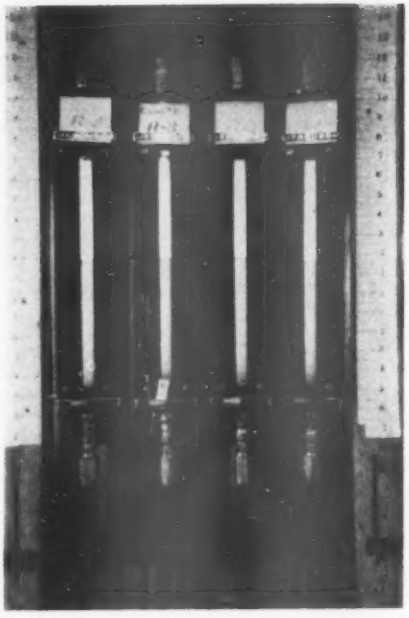
. . . put an end to down-the-hole check valve trouble

KENNAMETAL Inc., Latrobe, Pa.

Ask your supplier for Kennametal Balls and Seats



SCHEMATIC DIAGRAM of large-diameter orifice-meter testing installation, located near Refugio, Tex. Fig. 1.



ACTUAL PHOTOGRAPH of manometer readings taken during flow tests. Fig. 2.

Orifice-Meter Coefficients For Large-Diameter Lines

Joint A.G.A.-A.S.M.E. committee is comparing flow through 30-in. and 10-in. lines in research project

by F. Lawrence Resen
Gulf Coast District Editor

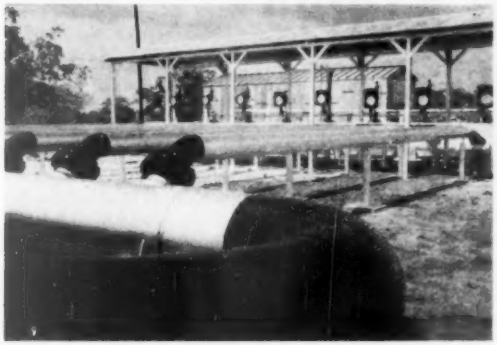
TEST SITE at Refugio. In foreground are blowoff valves. Two parallel 30-in. lines carry gas in and out of test equipment in background.

A PROJECT designed to evaluate measurement of gas through large-diameter pipe as compared to smaller sizes is under way near Refugio, Tex. There, a joint committee of American Gas Association and American Society of Mechanical Engineers, assisted by the National Bureau of Standards, has set up a $130,000 installation for comparing flow through 30-in. and 10-in. lines.

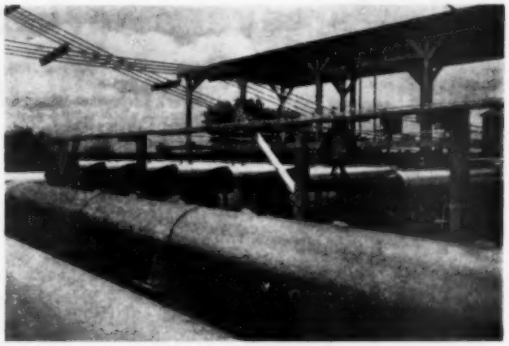
The project is part of long-range program begun in 1948 to study problems of main-line and wholesale measurement of gas.

The A.G.A.-A.S.M.E. group instituted the present project in order to evaluate metering of gas in large-diameter lines since the initial study was confined to tests on 14-in. pipe and smaller.

The main problem involved currently is to find coefficients for the larger-size meters. New coefficients for larger-size meters must be extrapolated. Experience of engineers has shown that measurement differences exist in almost all instances where comparisons have been made between tubes less than 14 in. and those greater than 14 in. In actuality, the difference between the smaller-size line measurements and those of larger diameter is relatively small, but the magnitude of volumes of gas handled by the large lines makes these differences assume significant proportions.



REFERENCE METER runs are used to compare the small-size pipe measurements with the large size, to uncover discrepancies in measuring gas flow in large pipes.



REFERENCE LINES enter a downstream header after having passed through conventional orifice flanges. Instrument lines are shown running from flange taps to instrument house.

The tests being conducted at Refugio are comparing measurement of gas flowing through a 30-in. line to measurement of the same flow through eight 10-in. lines in parallel (see Fig. 1). From data accumulated by various methods of measurement, an evaluation will be made of the flow coefficients through these sizes of pipe. From the evaluation, it is hoped that more accurate measurement of gas flow through large-size pipe may be achieved.

Test site . . . The installation of test lines and equipment has been made adjacent to Tennessee Gas Transmission Co.'s trunk lines which run northward from this area, and tests are being made through the cooperation of T.G.T., which is making its gas flow available to the project. The piping hookup is so arranged that gas flow may be diverted from the trunk lines, through the test station and then back into the trunk lines. Pressure on the lines is approximately 700 psi. while the volume of gas available for test purposes will be approximately 550 M.M.c.f. per day. At a later date approximately 750 M.M.c.f. may be available for additional tests.

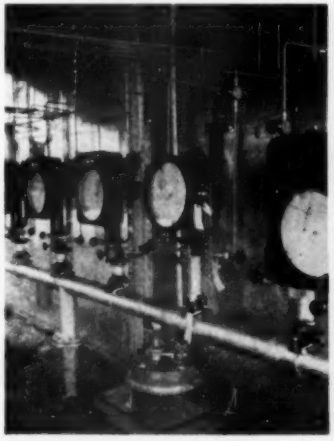
The gas entering through the test station flows through inlet and outlet orifices as well as orifices on each of the eight 10-in. meter runs. Pressures and differentials at all orifices are obtained by the use of high-pressure reflex gages and precision indicating gages. The indicating gages are constantly checked by deadweight testers. Readings of all gages are recorded simultaneously. In addition, differential instruments are installed for each orifice for recording differentials and pressures during the test periods. Flowing temperatures will be measured and recorded on the downstream side of each orifice throughout the tests.

Gas flow . . . Inlet gas from the two trunk lines passes through approximately 120 ft. of 30-in. pipe before reaching a conventional 30-in. orifice flange. Five types of meter connections are available at the flange for obtaining flow measurments. They are: (1) flange-type meter-connections, (2) corner-type meter connections, (3) meter connections ⅛ pipe diameter upstream from the orifice and ⅛ pipe diameter downstream from the orifice, (4) meter connections at one pipe radius upstream and ½ pipe radius downstream, and (5) meter connections at 2½ pipe diameters upstream and 8 pipe diameters downstream.

Instrument connection lines run from the 30-in. flanges to the instrument house, and those from the 10-in. lines run to a second instrument house. Inside the instrument houses are located sight-glass type reflex gages, installed so that they may be moved in a vertical direction. This makes possible a wide range of readings from 0-100 in. of water differential.

Fluorescent lights are mounted behind the gages and provide illumination for accurate reading. Readings are photographed simultaneously by 13 cameras. Photographs are then developed and read using an arrangement incorporating a standard photograph enlarger and a sliding board with marked reference lines. A typical photograph, taken during the official tests, is shown in Fig. 2.

In making readings the enlarger projects the negative image upon the reference board. This board is adjusted, using sliding rods plus a screw-type vernier adjustment. Reference lines are brought into perfect alignment with the



RECORDING CHARTS are shown on outside of 30-in. instrument house. Differential reflex gages are located within.

REFLEX U-GAGES are mounted on sliding rails so that pressures up to 100 in. of water may be determined.

"...for every sack of BAROID is exactly like the last...TOPS!"

In the oil fields, "BAROID" is the standard term for weight material. That's because, ever since BAROID came on the scene, back in 1926, operators have relied on BAROID'S unvarying quality. Each sack of BAROID is like every other — the same high specific gravity, the same fineness of grind (95% through 325 mesh), the same freedom from abrasive particles. Its suspending qualities are uniformly excellent, and it is completely inert chemically and non-corrosive.

Because operators know that BAROID is always the same top quality, with no variation from one lot to another, genuine BAROID remains the first choice, the leader in mud-weighting material.

500 Distributors, strategically located for on-the-minute service to every active drilling area, can supply you with BAROID in any quantity you require.

Baroid

BAROID SALES DIVISION, NATIONAL LEAD COMPANY

Main Office: Houston, Texas • P. O. Box 1675, Houston 1

HOUSTON ☆ TULSA ☆ LOS ANGELES

graduated scale mounted on the reflex gage assembly. Readings may thus be made with a high degree of accurarcy.

The 30-in. line continues for 40 ft. downstream of the flange where it connects with a 30-in. loop header which is approximately 48 ft. long. On the downstream side of this header, eight 10-in. lines run parallel for a distance of approximately 50 ft. to enter another 30-in. looped header which is the outlet side of the installation.

The looped header equalizes the gas flow through the 10-in. lines each of which is equipped with conventional orifice flanges. The instrument lines from these eight parallel lines run to a battery of recording meters and also to the instrument house where the adjustable reflex gages are located.

The 30-in. outlet line from the downstream looped header doubles back parallel with the incoming line. The gas then passes through a special orifice fitting meter tube which permits changing orifice plates without cutting off the pressure of the system. At this orfifice, pressure connections are located the same as for the incoming conventional orifice flange, with the exception that a corner-type connection is not used. The gas then passes through some T.G.T. pressure and flow test equipment on its way back to the 24-in. main lines. Throughout the tests, all of the gas used, with the exception of a negligible quantity exhausted during blowdowns, will be returned to the T.G.T. system.

In addition to the regular testing equipment, pulsating test equipment has been included at the site to record extent of any surges in the line that may develop when tests are being conducted.

Evaluation . . . From the data obtained at the test site, calculations will be made using present coefficient data in A.G.A. Report No. 2 and the A.S.M.E. Fluid Meter Report.

Increased accuracy of measurements will result in:

1. A better determination of the rate of gas flowing through line.

2. More effective and economical control of the serious problem of line losses and accompanying leakage, inspection and testing costs.

3. Closer maintenance of line efficiency, since meter accuracy—if it were able to indicate when cleaning and pigging were necessary—would help to reduce operating costs.

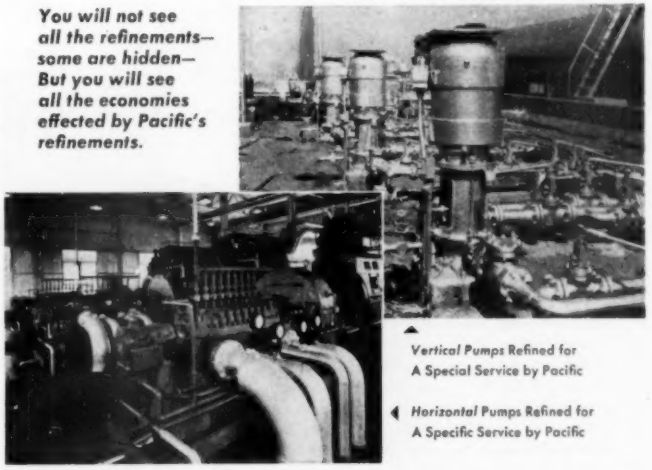
Project cost . . . The total project at Refugio is estimated to cost approximately $130,000. Of this amount, A.G.A. has contributed $37,000. Material contributed or loaned by manufacturers and the gas industry has

When your need is the economical transfer of liquids from one location to another . . .

Specify **PUMPS REFINED FOR YOUR SPECIFIC SERVICE**

BY Pacific

You will not see all the refinements—some are hidden—But you will see all the economies effected by Pacific's refinements.



Vertical Pumps Refined for A Special Service by Pacific

Horizontal Pumps Refined for A Specific Service by Pacific

You will not see:

★ the balanced proportions of the heavy sections or the quality of the selected materials of construction that insure extra strength with extra allowance for corrosion.

★ the dynamic or the hydraulic balance that eliminates vibration. the precision workmanship and finish that insure perfect fit for all parts.

You will see:

★ curves outlining liquid passages formed and proportioned for high efficiency streamlined flow without turbulence, destructive caviatation or erosion.

★ **IN YOUR MONTHLY STATEMENTS AN OUTSTANDING RECORD OF AVAILABILITY—RELIABILITY—LOW COST FOR OPERATION AND MAINTENANCE.**

PACIFIC *Precision Built* **PUMPS**

Pacific Pumps inc.

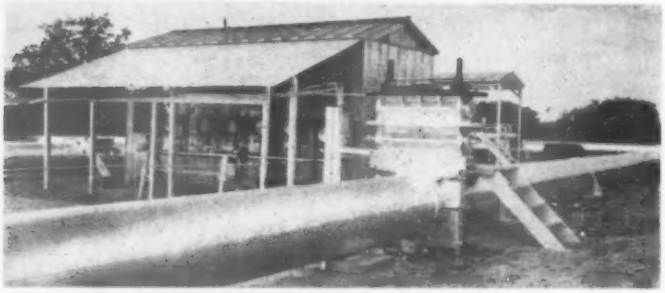
ONE OF THE DRESSER INDUSTRIES

HUNTINGTON PARK, CALIFORNIA

Export Office: Chanin Bldg., 122 E. 42nd St., New York

Offices in All Principal Cities

PP-15



SPECIAL ORIFICE FITTING allows plates to be changed without bleeding pressure line. Instrument house for 30-in. line is in background.

amounted to $60,000, and labor contributed has amounted to $10,000. The remaining costs are largely labor which will be contributed by the manufacturers and the industry. Two full-time personnel have been engaged by the committee for the program. Project engineer is T. J. Filban; his assistant is I. E. Vas.

The immediate project stems from the organization in 1948 of a joint committee for study of gas-measurement problems by the A.G.A. gas-measurement committee and the A.S.M.E. fluid-meter committee. Head of the committee is H. S. Bean, National Bureau of Standards. Chairman of A.G.A. gas measurement committee is E. F. Schmidt, Lone Star Gas Co., and chairman of A.S.M.E. fluid meter committee is Prof. S. R. Bietler, Ohio State University.

The subcommittee in charge of large-diameter program has E. E. Stovall, Lone Star Gas Co., Dallas, as the head, and other members as follows: W. A. Griffin, Daniel Orifice Fitting Co., Houston; N. B. McKinney, Lone Star Gas Co., Dallas; H. B. McNichols, Columbia Engineering Corp., Columbus; E. N. Armstrong, Transcontinental Gas Pipe Line Corp., Houston; E. S. Plank, Tennessee Gas Transmission Co., Houston; Pat H. Miller, Texas Eastern Transmission Corp., Shreveport; Earl Rush, Pipe Line Co. of America, Joliet, Ill.; C. F. Rittmann, El Paso Natural Gas Co., El Paso, Tex.; R. L. Rountree, United Gas Pipe Line Co., Shreveport; J. T. Pruet, Trunkline Gas Supply Co., Houston; Frank Partridge, Southern California Gas Co., Los Angeles; and John L. Gere, Cities Service Gas Co., Oklahoma City. Griffin, Plank, and Rountree are group leaders in the project.

Thompson DOES

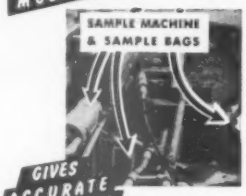
Double Duty

in OIL FIELDS!

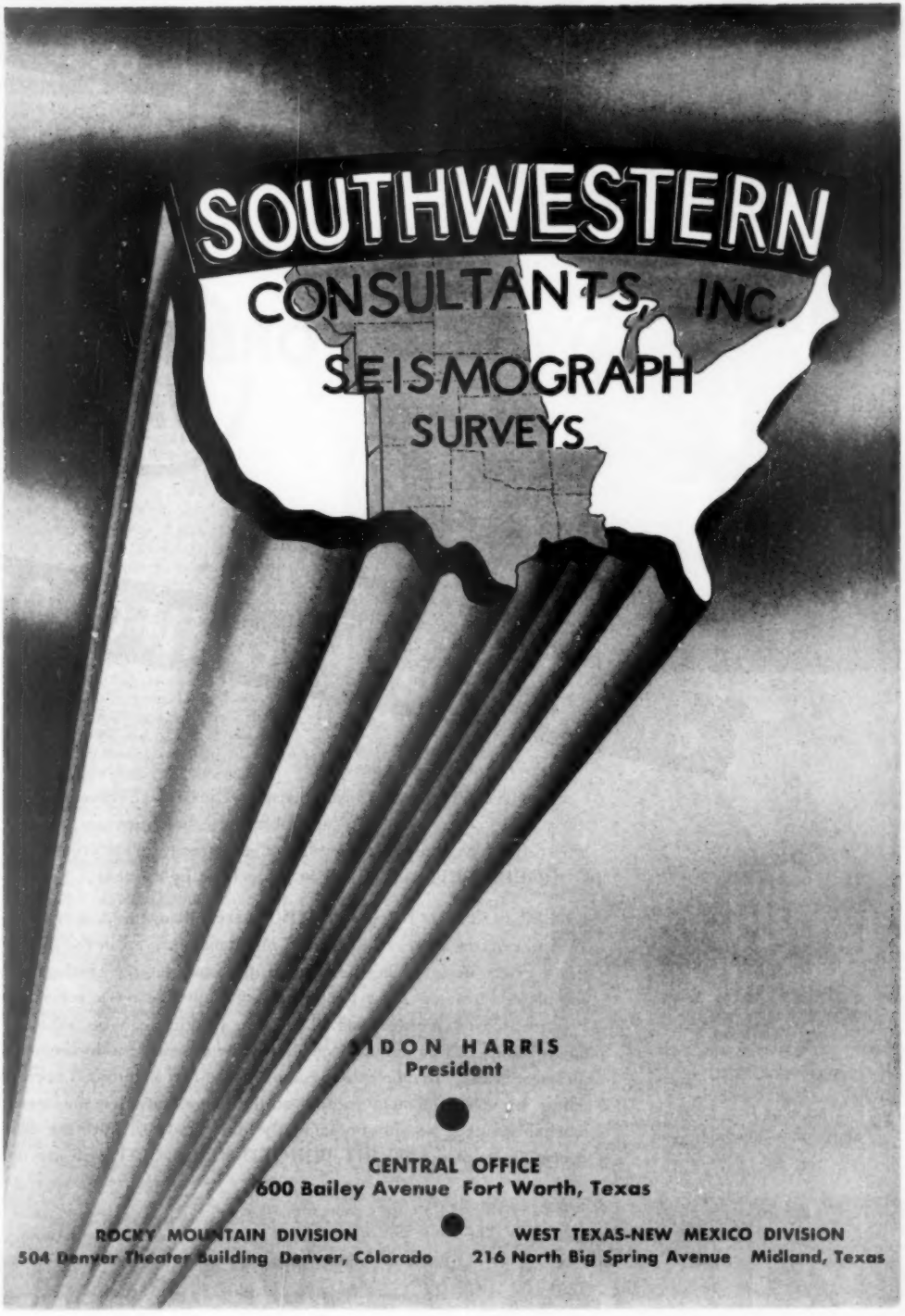
SHALE SEPARATOR & SAMPLE MACHINE

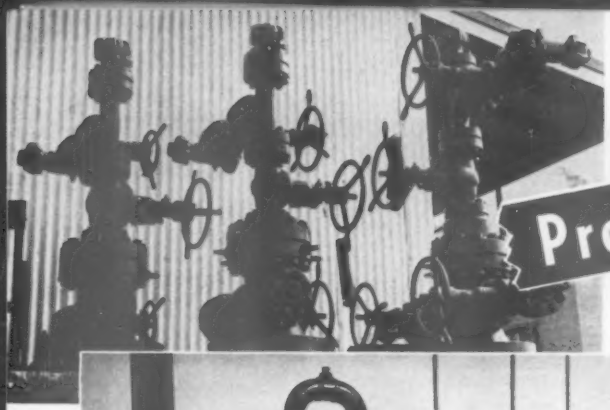
Thompson does a double duty job and does it better: (1) by removing destructive shale and abrasives from your drilling mud, it saves you money because unnecessary wear and tear on costly drilling equipment is reduced to a minimum, and (2) the Sample Machine (standard equipment) gives an accurate analysis of the progress of the well by collecting foot-by-foot cuttings. Thompson Separators are self-motivated, activated by the mud flow. Make Thompson a part of your standard drilling equipment.

★ PROVEN PERFORMANCE
★ ECONOMICAL OPERATION
★ SAVES DRILLING COSTS



"It may be unscientific but he has the best record of completions of any geologist in the company."

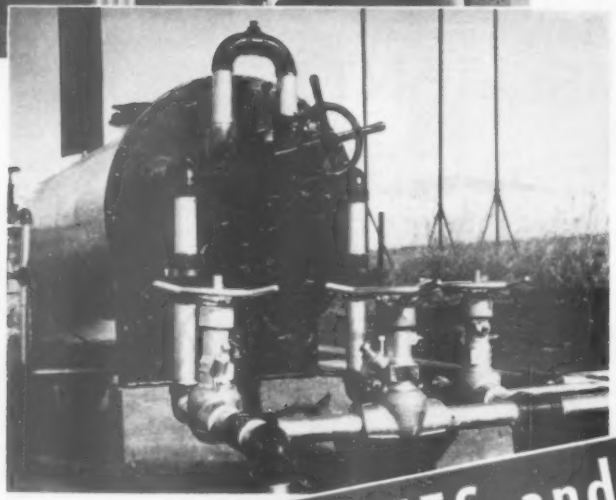

SOUTHWESTERN
CONSULTANTS, INC.
SEISMOGRAPH
SURVEYS
IDON HARRIS
President
CENTRAL OFFICE
600 Bailey Avenue Fort Worth, Texas
ROCKY MOUNTAIN DIVISION
504 Denver Theater Building Denver, Colorado
WEST TEXAS-NEW MEXICO DIVISION
216 North Big Spring Avenue Midland, Texas



Protect Production

with

ORBIT VALVES®



on TREES and MANIFOLDS

Some operators purchase prefabricated Christmas Trees and Manifolds while others choose to assemble these hook-ups on location. In either instance, the operator cannot go wrong in selecting ORBIT FORGED STEEL VALVES to protect his investment.

ORBIT FORGED STEEL VALVES are full opening, easy to operate and require a very minimum of maintenance even in the most rugged services because the mechanism that operates the seating core is completely isolated from the cavity of the valve by a special stem Plastic packing arrangement. The stem packing can be adjusted or new packing can be added if needed while the valve is in service and under pressure. No lubricant is required to effect a shutoff. Lubrication points are so strategically located on the valve body that the operating mechanism need be only occasionally lubricated to insure the ease of operation for which ORBIT FORGED STEEL VALVES are noted.

BRANCHES

HOUSTON, TEXAS
407 Velasco
(Serving the Gulf Coast)

ODESSA, TEXAS
402 West County Road
(Serving West Texas)

CASPER, WYOMING
LeRoy Mitchell, Distributor
(Serving the Rocky Mountain States and Canada)

ORBIT VALVE COMPANY

BOX 699 **TULSA, OKLAHOMA**

What Is the Future of Petroleum Discovery?

(Continued from page 259)

confident that the approaching exhaustion of our reserves is so far in the future that no attempts to make these fuels on an uneconomic basis via synthetics or to restrict their end use are necessary in the foreseeable future.

Discovery Trends

The previous graphs cover a very limited number of years and may be only a part of a cycle which started high because we were achieving maximum results from seismograph work at the time the graph started. For this reason it is advisable to study a long-range picture of the trend of discoveries. Unfortunately, we cannot use exploratory-well figures for this purpose because reliable figures are not available prior to 1935.

In the absence of exploratory-well information, dry holes drilled may be used as a measure of effort and discoveries per dry hole as a measure of success. Fig. 3 shows discoveries per dry hole plotted against cumulative discoveries from the beginning of the industry to date. In this case the oil added each year reported by the American Petroleum Institute's reserves committee is credited to that year regardless of the year of field discovery. This figure fits well with the use of dry holes as a measure of discovery effort since dry holes result from both development and wildcat effort. Minor variations in the curve have been eliminated by the use of 3-year moving averages.

Variations discussed . . . It will be noticed that the discoveries per dry hole reached a peak in 1929 after trending upward until that time. By 1932, they reached a very low point primarily because the price of crude oil was so low at that time that little effort was being made to discover more oil. The peak reached between 1932-1937 does not indicate that the greatest success in new discovery came in the year 1937. Actually, during these years the industry was adding many reserves by drilling a large number of development wells in fields which had been discovered in previous years.

The most significant part of this graph is that since 1939 it shows that discoveries per dry hole are holding up very well and have been maintained at a level higher than any time prior to 1929, in spite of the fact that new discovery figures for recent years are, as always, ultra conservative. The 1-year figure for 1951 is indicated on the graph with an "X."

By total wells . . . Fig. 4 shows a plot of the percentage of total wells finding oil from 1860 to date. Moving 3-year averages are again used in order to eliminate minor fluctuations.

In the early 1860's, the success percentage was high, due probably to the exploitation of a few shallow fields located by oil seeps. In the early 1870's, development of Bradford pool began. This field was a major find at relatively shallow depths and was drilled on a very close spacing pattern. As a result, the success percentage was high. Then the industry entered a prolonged period during which the success percentage gradually declined. This gradual decline continued until about 1920 and can be attributed chiefly to a gradually increasing percentage of exploratory wells.

From 1920 until 1930, a period of scarcity existed and wildcat activity was greatly expanded in an effort to find major new sources of oil. This expanded activity pulled the success

KERRIGAN a Great Name in Grating

With the WELD that Never Fails!

Kerrigan grating is a one-piece INSEPARABLE unit. Bearing bars and cross-bars are WELDFORGED by Kerrigan's exclusive process into ONE PIECE. Resulting grating is a strong, anti-slip, easy-to-clean grating that affords maximum light and ventilation, a minimum of installation and maintenance expense, and long years of trouble-free use.

BONDERIZED for rust resistance and extra protection against corrosion! Holds paint to metal for durable finishes.

WRITE FOR CATALOG AND SPECIFICATION SHEETS;

and for a copy of "A PICTURE STORY OF KERRIGAN" which shows how KERRIGAN Weldforged steel grating is custom engineered . . . and how Kerrigan's Never-Fail Weld stands up under the severest kind of punishment. Just write on your letterhead for free copy.

Weldforged GRATING DIVISION

KERRIGAN IRON WORKS, INC.
NASHVILLE, TENNESSEE
GENERAL SALES OFFICE 274 MADISON AVE., N.Y.C.

percentage sharply down. Shortly thereafter East Texas field was discovered and during the next few years the drilling of this field on a close spacing pattern provided relatively few dry holes and also decreased the incentive for wildcat activity elsewhere. This was the period when crude oil was selling at distress prices. Also, during this same period, geophysical methods of oil location were becoming firmly established and their initial successes maintained a satisfactory success percentage until about 1940.

The steel-allocation provisions during World War II brought about a sharp curtailment in development drilling but fostered the continuation of exploratory drilling. This resulted in a decreased success percentage. As development drilling picked up in the later years of the war and as a result of infill drilling in the early postwar years, the success percentage rose noticeably. It now appears that it has reached its peak and will probably turn down again, particularly if industry's exploratory program continues to increase at current rates.

The character of the manufacturer
shows in the product
HARRISBURG SEAMLESS STEEL PIPE COUPLINGS
are manufactured to A.P.I. and A.I.S.I. Specifications. Harrisburg's precision manufacturing methods, the result of 99 years of experience, produce remarkable thread accuracy and uniformity of product.
We shall be pleased to mail a copy of the Harrisburg Couplings Catalog and quote prices, upon request.
Harrisburg
COUPLINGS
HC52-1
99 Years in Pennsylvania's Capital
Harrisburg Steel
CORPORATION
HARRISBURG 6, PENNSYLVANIA

Actually, the last valley in the curve occurring in 1943 seems to have resulted solely from the war. In the absence of a war, the curve probably would have gradually sloped off from the 1937 peak to its present value, making one major cycle instead of the cycle and a half which the graph shows.

Decline explained . . . Various factors other than an increasing percentage of exploratory wells have been advanced as the cause of the long-term decline on Fig. 4.

The industry has, through the years, adopted wider and wider well-spacing patterns. Wider spacing increases the proportion of dry holes required to delineate a field thus increasing the percentage of dry holes which the industry drills.

There is some belief that the average field size has been decreasing, and by field size, surface acres rather than reserves is meant. If it is true that the areal extent of the fields being discovered is becoming smaller, then there is reason to believe that development of these fields would require a larger percentage of dry holes than the development of bigger fields in the past.

The advent of secondary-recovery operations has resulted in the drilling of various service wells which increase the total number of wells drilled without increasing the number of wells that produce oil.

In the earlier days of the industry when gas fields were discovered they were often abandoned and received no subsequent development, whereas, in recent years with the development of vast markets for natural gas it has become common practice to seek out and develop gas fields. The development of gas reserves again increases the total number of wells drilled without increasing the number which produce oil and, consequently, reduces the success percentage when stated in terms of oil wells only.

Contrary to the factors just pointed out, all of which would tend to decrease the success percentage, we have advanced completion and production techniques which today make it possible to complete many wells as commercial producers which would have been abandoned as noncommercial in earlier days.

Exploratory Drilling

Since 1935, the industry's exploratory drilling effort has been recorded by Dr. Lahee and his A.A.P.G. committee. The statistics of this committee show that the number of exploratory wells drilled has increased from about 1,700 in 1935 to 11,756 in 1951. A continuation of this rate of increase would indicate that the industry would drill about 20,500 exploratory wells in 1955.

Some people see this increasing intensity of the industry's exploratory program as a sign of weakness, pointing out that the rapidly expanding exploratory program would be unnecessary unless we are having difficulty finding sufficient oil. There are numerous reasons behind the rapid increase in exploratory activity. There

The **E-C Inclinometer** gives you

More of a Run for Your Money...

than *Any Other* straight hole instrument

When you run a SPERRY-SUN E-C...

1. **You know positively** — that the instrument was at rest when the record was made, otherwise the disc will show no reading.

2. **You know positively** — that the reading is accurate because you can run a simple double check in a few minutes by raising the instrument several feet and lowering it again to the recording depth for another reading.

3. **And you can measure positively** what the inclination of the hole is at several points, if required, by taking several readings on one trip. The E-C is the **only** straight hole instrument with which several records may be taken on a single run.

You will learn, too, after a single run that the E-C is fast to run, thus reducing "down time", and that with reasonable care it will stay accurate and on the job without maintenance grief. E-C rental rates are reasonable. You do not pay a premium rate for the premium performance of the instrument.

Rent an E-C and keep it on the rig until the last foot of hole is made. It will give you more information with less cost, less work and less trouble than any other straight hole instrument.

The E-C records by running an electric current through a current-sensitive recording disc. The current produces a white dot on the disc when the instrument is allowed to be at rest for 60 seconds. The size of the dot increases the longer the instrument remains at rest, thus permitting multiple recording when required, simply by varying the "at rest" period at various depths. E-C records are permanent. E-C instruments are available in two ranges: 6° and 10°.

SPERRY-SUN WELL SURVEYING COMPANY

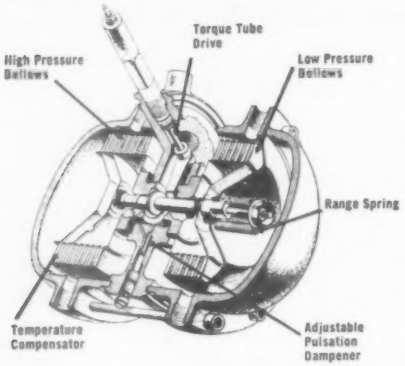
3118 BLODGETT AVENUE HOUSTON, TEXAS

Philadelphia, Pa. Falfurrias, Odessa, Marshall, Texas Long Beach, Ventura, Bakersfield, Calif.
Oklahoma City, Okla. Lafayette, La. Moulden Oil Field Services, Casper, Wyo.

BARTON FLOWMETERS
with

DUAL
STAINLESS STEEL
RUPTURE-PROOF BELLOWS

INSURE LOWER MAINTENANCE COSTS



ALL MAJOR SOURCES OF TROUBLE inherent in other differential-pressure meters ARE ELIMINATED IN BARTON Rupture-Proof FLOWMETERS!

NO LIQUID SEALS TO LOSE–corrosive and volatile liquids are handled without seal pots, thus reducing installation and upkeep costs.

NO MERCURY USED–hence, no costly losses due to leakage or theft, and no contamination of liquid being handled. Likewise, installation can be made without accurate leveling.

EASY TO OPERATE–Unskilled personnel can put a BARTON in operation without danger of damage to the meter.

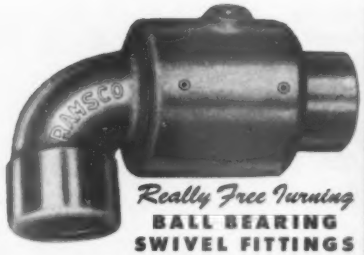
CLEANING ISN'T NEEDED–a BARTON drains or vents itself completely. No pockets to trap condensates. No floats, chains, or links to corrode. Assures permanent positive accuracy.

for measuring

FLOW • LIQUID LEVEL • DIFFERENTIAL PRESSURE

WRITE FOR DETAILS IN BULLETIN 11C4 TODAY!

BARTON INSTRUMENT CORPORATION
1433 SO. EASTERN AVE., LOS ANGELES 22, CALIF.



Really Free Turning
BALL BEARING SWIVEL FITTINGS

RAMSCO

FOR LIQUID GASES, STEAM, AND CHEMICALS. HOT OR COLD SERVICE. CONTINUOUS OR OCCASIONAL ROTATION.

360° FREE ROTATION—1, 2 AND 3 PLANES FITTINGS AND PRESSURES TO 15,000 P.S.I. AND TEMPERATURES TO 750° F.

Over 500 sizes, types, styles. Low pressure fittings ⅜" to 14". High pressure and high temperature ⅜" to 6". Universal service (U.S. type) fittings and pressures to 1,000 psi. Temperatures to 750° F. asbestos packed. When packed with Teflon ideal for corrosive surfaces. Gear driven types for loading racks also available.

Send for complete catalog and prices. State kind of service, pressure, temperature, pipe size and indicate style at left, threaded, flanged or weld ends.

RAMSCO
RASMUSSEN MFG. CO.
12305 INDUSTRIAL AVENUE
HOLLYDALE, CALIFORNIA

YOU GET

- MORE NEOPRENE IN THE PROTECTING JACKET! It is Certified to contain not less than 60% by weight of new Neoprene. This INCREASES SAFETY MARGIN, INCREASES RESISTANCE, INCREASES SERVICE LIFE!
- LONGER-LASTING COLD RUBBER INSULATION!
- GREATER FLEXIBILITY!—engineered, rope-like flexibility.
- MORE CONVENIENCE! Jackets are branded with full identifying data. Coils are packaged in neat shelf cartons.

Bears symbol "P116BM," flameproof registration number of the U. S. and Pennsylvania Bureaus of Mines.

SOLD NATIONALLY BY ELECTRICAL WHOLESALE DISTRIBUTORS

Bronco 60 Certified is an Achievement of
WESTERN INSULATED WIRE CO.
LOS ANGELES 58, CALIFORNIA

is an increasing tendency of the oil industry to use the drill as an exploratory tool and to drill wells which have only a moderate expectation of being successful, but which will yield valuable subsurface information.

Wildcats encouraged . . . Conditions during a number of years since 1937 have been such as to encourage the drilling of more exploratory wells than were necessary. During World War II material shortages made it attractive for many operators to speed up their exploratory-drilling programs. Since most exploratory wells are dry holes, they require less steel than development wells and any operator who could expand his exploratory drilling program and retard his development drilling program made his limited steel supply last longer.

More discoveries . . . In spite of the rate at which the exploratory drilling program of the industry has been expanding, there has been an increase in the percentage of exploratory wells discovering new oil fields. In 1935, only about 11.3 per cent of the exploratory wells recorded by Dr. Lahee found oil. This percentage, although varying somewhat erratically, has increased to 15.0 per cent in 1951, indicating that the increase in the number of exploratory wells drilled has not been made at the sacrifice of success in discovering new pools.

Additions to Reserves

The most important matter, of course, is the number of barrels of oil added as a result of the industry's drilling program. As long as the industry can continue to add substantial amounts of petroleum at moderate costs, it is fulfilling its function.

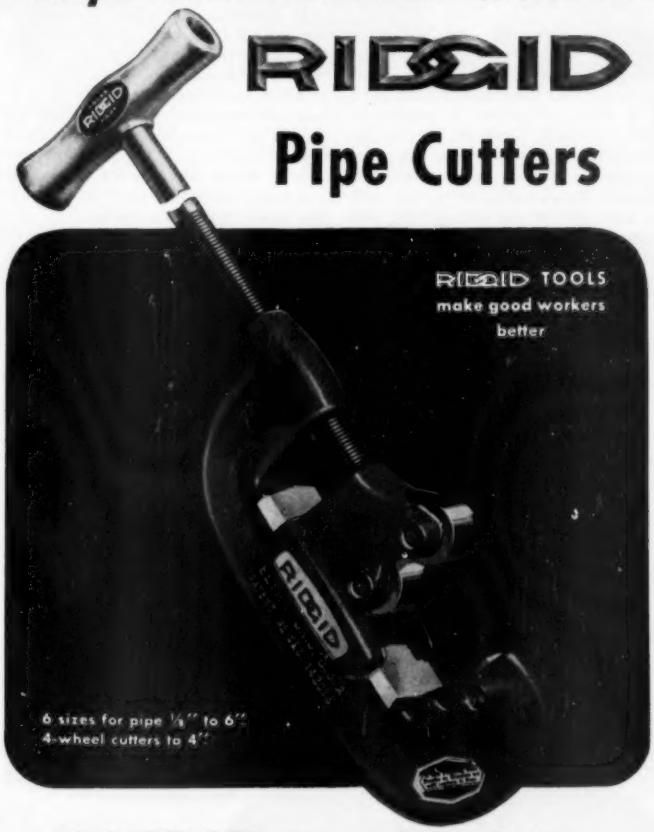
Fig. 5 shows the amount of oil added each year versus the total number of wells drilled in that year. The amount of oil indicated is the yearly A.P.I. figure for oil added. There is a very clear relationship between the amount of new oil added and the number of wells drilled and this relationship has held reasonably well for the last 15 years. It can be presumed that it held even before that time although A.P.I. discovery figures were first compiled in that year.

It thus seems clear that at present and as far as can be seen in the future, the industry will be able to increase reserves and productive capacity in direct proportion to the number of total wells which are drilled. Again the data are based on a 3-year moving average and a 1-year figure for 1951 is indicated. This 1951 figure appears un-

Why Skilled Workmen Insist On

RIDGID

Pipe Cutters



RIDGID Heavy-Duty Cutters
assure you extra quick easy pipe cutting

★ High alloy thin-blade cutter wheels roll quickly through pipe with least effort—clean, almost burrless cuts.

★ Special malleable housing guaranteed warp-proof, assures perfect tracking of cutter wheel—every tool factory tested.

★ Efficiency-balanced design for quick easy work—made for long hard service.

★ Order from your Supply House.

THE RIDGE TOOL COMPANY, ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

usually high but when averaged with the 1952 figure next year it will probably be much nearer the trend.

Production supported . . . The most important trend, in our opinion, is that during recent years we have been adding to reserves considerably faster than oil is being consumed. It should be borne in mind, however, that in an expanding oil economy reserves must increase faster than production. The physical characteristics of our oil wells are such that on the average they will produce only 8 per cent of their oil per year. Therefore, it is necessary to add slightly over 12 bbl to our reserves before we can increase our yearly production by 1 bbl.

If domestic production increases at the rate of 4 per cent a year we must find each year about 50 per cent more than is produced. Fig. 6 shows the rate at which reserves are being added each year as compared with the rate of growth of United States oil production and, in addition, a line to show the rate at which the industry needed to add new reserves in order to support the production levels shown.

The figure shows that the industry is finding considerably more oil than is needed. The trend of United States crude-oil production has been increasing about 66 million barrels per year since 1942. The trend of reserves added has been increasing 275 million barrels per year. This is the most encouraging and positive trend which can be identified today.

Keep bottom water out of your wells—and prevent costly shutdowns—by tamping Eagle-Picher Lead Wool in the hole. A watertight plug that seals every crack and crevice is made by this finely stranded, flexible metallic wool. Shipped in convenient 50-lb. sacks . . . easy to spot in special cartridge-shaped Eagle-Picher Wire Containers sized to fit all casings. Order through your jobber.

3 Eagle-Picher Bearing Metals that meet most requirements

1. **Dreadnaught**—for extreme speed and heavy-duty conditions.
2. **Outlasta**—for medium speed and average-load conditions.
3. **Durable**—for low speed and light-duty conditions.

THE EAGLE-PICHER SALES COMPANY

Since 1843 • Metallic Products Division
General Office, Box 777, East Chicago, Indiana
Cincinnati • Kansas City • East St. Louis • Dallas • Houston
MEMBER: LEAD INDUSTRIES ASSOCIATION

EAGLE EP PICHER

L.P.G. Goes Underground

(Continued from page 261)

tual projects exist, to the knowledge of the writer, in which a storage cavity has been created by aqueous disintegration of hydratable (cavy or heaving) shales. However, the feasibility of this method has been discussed and tests have been made to determine: (1) slacking and dispersion of shale in water, and (2) retardation of the dispersion when desired. Cost estimates indicate cost of this type of cavity would be somewhat higher than that of washed-out salt cavities.

Salt mines . . . In some salt domes brine operations are conducted while in others actual mining operations are going on. Disadvantages attending use of early salt mines for underground storage are: (1) homes and plant buildings have been erected over many of these early cavities, (2) production casing not properly set allowing natural gas to leak in, (3) improper plugging on abandonment, and (4) interconnection between closely spaced mines.

Cavities created in Gulf Coast salt domes at a later date and through carefully engineered drilling are considered more favorable for storage use. Roof stability is an important factor. Fracture and caving of roofs in bedded section mines as well as salt dome mines would be a problem.

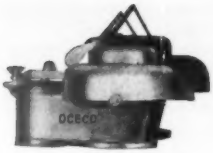
Mined shale cavities . . . Several installations of this kind have been completed and several others are under way or being planned. A brief description of one such installation has been given.[6] In this particular installation compressed recycle vapors from the plant are used to displace L.P.G. from storage.

Mined hard rock . . . Factors involved in excavating storage in hard rock have been summarized.[7] A "tight" rock formation must be found—one that will hold propane.

Abandoned coal mines . . . These are not very good possibilities due to weak structural properties of coal, its frequent association with permeable rocks, and possibility of contamination.

Storage in Permeable Sands

In considering natural underground

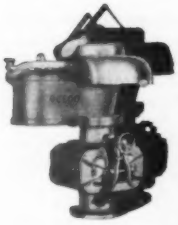


V-113 VENT VALVES control tank breathing, minimizing vapor losses and deterioration of product. High flow capacity. 2" to 12" sizes. ½ oz. to 8 oz. pressure or vacuum settings.

GAUGE HATCHES provide a gas tight closure for gauging, sampling and taking temperature readings. Pedal type hatch opens with a natural straight downward foot movement. Flanged or screw mounting. Also clamping cover type for pressures from 2 oz. to 15 lbs.

OCECO ROOF MANHEADS provide a gas tight closure on the tank roof. White metal or composition sealing ring. Furnished in 20" size only.

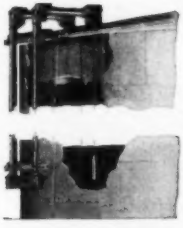
V-108 EMERGENCY PRESSURE RELIEF VENTS provide instant relief for excessive internal pressures, resulting from exposure fires, etc. Furnished in 6", 8", 10", 15½" and 20½" sizes.



TYPE "BE" VENT UNITS consist of a V-113 Vent Valve with snuffer, mounted on a Type "E" "Extensible" Bank Flame Arrestor, 2" to 10" sizes. Unsurpassed for efficiency and reliability.

SWING LINE EQUIPMENT —complete facilities including heavy duty tank nozzle; efficient double elbow swing joint; swing pipe; cable clamp; cable; sheave bracket and internal or external winch.

TYPE "E" FLAME ARRESTORS can withstand long exposure to fire. The "banks" have vertical straight through passages—minimizing entrainment and pressure drop, and are "extensible" for easy cleaning. 2" to 10" sizes.



GAUGING EQUIPMENT—wide variety of types for roof or on the ground readings of cone, umbrella, floating, or expansion roof and spheroid tanks. Pressures ranging from 0 to 125 lbs. per sq. in.

V-114 INTERNAL TANK VALVES are provided with a fusible link that melts when subjected to fire, closing the valve instantly, and cutting off the flow. 3", 4", 6", 8", 10", 12" and 16" sizes.

WATER DRAW-OFF VALVES for drawing water from the bottom of storage tanks. Unique double valve construction permits the valve chamber to be drained to prevent freezing, and the working valve serviced without emptying tank. 2"x1½"; 3"x2" and 4"x3" sizes.

OCECO

Engineering and Sales Representatives in the Principal Cities

THE JOHNSTON & JENNINGS COMPANY

4700 West Division Street • Chicago 51, Illinois

★ *division of* **PETTIBONE MULLIKEN CORPORATION** ★

This EXCLUSIVE FEATURE
Is the Key to Longer Service
WILLIAMS
"SUPERJUSTABLE"
WRENCHES

● The added strength and service life of Williams "Superjustable" wrenches is due to the exclusive design of the square shoulders on the shank portion of the sliding jaw. This provides maximum and positive bearing against working stress. Wedging and spreading action, common in ordinary wrenches, is eliminated. Also, the "web" on the jaw is thicker and stronger without increased thickness of the wrench head.

Drop-forged from select Alloy Steel, "Superjustables" are thinner and lighter, yet stronger and tougher. Fully guaranteed. They give you an accurate fit . . . are easier to use . . . never stick. Ask to see them at your nearest supply store.

NEWEST in a line famous for quality
WILLIAMS
"VULCAN" REVERSIBLE
DROP-FORGED
CHAIN PIPE TONGS

For both pipe and fittings 1/4" to 8", this model permits you to turn either direction without removing tong or loosening the chain. One of four styles of Chain Pipe Tongs and three styles of Chain Pipe Vises available through your supply store. Ask for Catalog A-70 or 430.

write direct for your copy.

WILLIAMS
J. H. WILLIAMS & CO.
430 Vulcan Street Buffalo 7, N.Y.
DROP FORGINGS AND DROP-FORGED TOOLS

reservoirs, existence of natural caverns may be mentioned, but these are not deemed favorable for underground storage. However, considerable work has been done in the injection of L.P.G. into wholly or partially depleted gas, condensate, or oil sands and into salt-water sands.

Disadvantages of storage in permeable sands are (1) low initial recoveries and (2) recovered liquid may have to be reprocessed due to mixing with reservoir fluids. However, an interesting application is in progress in which L.P.G. may be stored and then used to increase ultimate recovery from an abandoned reservoir.[8] Injection of butane through tubing and propane through casing in dually completed distillate reservoirs has been accomplished[10] and results when butane was reproduced have been released.[11] Storage of L.P.G. in salt-water sand has been described.[12] It is estimated that some 1,500,000 bbl. of L.P.G. has been injected into gas sands in Texas in various experimental projects.[13]

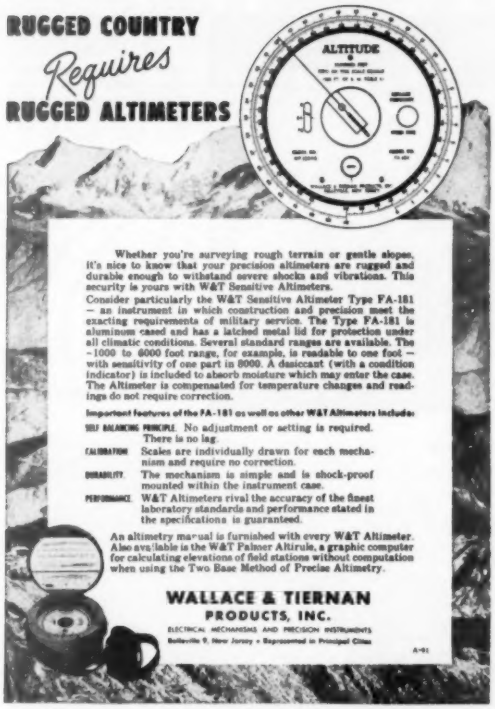
Costs

Cost of washed-out salt cavities depends on many factors, including (1) thickness of salt bed, (2) well depth (3) drilling costs, (4) casing pattern and cementing cost, (5) salt water disposal facilities, and (6) size of cavity. For a cavity of 100,000-bbl. capacity with well depth between 2,000 and 4,000 ft. cost will run at about $0.75 to $1.00 per barrel of capacity. For smaller-capacity reservoirs in the same depth range cost will be between $1.00 and $2.00 per barrel.

Selected Bibliography

1. National Petroleum Council, "Report on Underground Storage," April 22, 1952.
2. "Man-Made Reservoir," The Oil and Gas Journal, Aug. 17, 1950, p. 59.
3. "L.P.G. Goes Underground," The Oil and Gas Journal, July 14, 1952.
4. "100 Per Cent Recoveries—Coring Salt," The Oil and Gas Journal, March 3, 1952, p. 81.
5. "How to Install and Operate Underground Storage," The Oil and Gas Journal, May 5, 1952, p. 218.
6. The Oil and Gas Journal, May 5, 1952, pp. 175, 257.
7. "Excavating Underground L.P.G. Storage," The Oil and Gas Journal, May 5, 1952, p. 208.
8. "Underground L.P.G. Storage," The Oil and Gas Journal, Dec. 28, 1950, p. 43.
9. "Oil Recovery by L.P.G. Injection," The Oil and Gas Journal, June 30, 1952, p. 58.
10. "Dual L.P.G. Injection," The Oil and Gas Journal, May 3, 1951, p. 143.
11. "L. P. G. Injection Results,, The Oil and Gas Journal, May 10, 1951, p. 157.
12. "Underground Storage . . . L.P.G.," The Oil and Gas Journal, June 8, 1950, p. 50.
13. Minutes of NPC committee, Houston, Oct. 1-2, 1951.
14. "Experimentation . . . Underground Storage," The Oil and Gas Journal, April 20, 1950, p. 156.

RUGGED COUNTRY
Requires
RUGGED ALTIMETERS



Whether you're surveying rough terrain or gentle slopes, it's nice to know that your precision altimeters are rugged and durable enough to withstand severe shocks and vibrations. This security is yours with W&T Sensitive Altimeters.

Consider particularly the W&T Sensitive Altimeter Type FA-181 — an instrument in which construction and precision meet the exacting requirements of military service. The Type FA-181 is aluminum cased and has a latched metal lid for protection under all climatic conditions. Several standard ranges are available. The –1000 to 6000 foot range, for example, is readable to one foot — with sensitivity of one part in 8000. A desiccant (with a condition indicator) is included to absorb moisture which may enter the case. The Altimeter is compensated for temperature changes and readings do not require correction.

Important features of the FA-181 as well as other W&T Altimeters include:

SELF BALANCING PRINCIPLE. No adjustment or setting is required. There is no lag.

CALIBRATION. Scales are individually drawn for each mechanism and require no correction.

DURABILITY. The mechanism is simple and is shock-proof mounted within the instrument case.

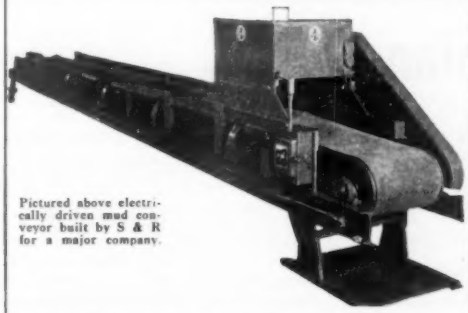
PERFORMANCE. W&T Altimeters rival the accuracy of the finest laboratory standards and performance stated in the specifications is guaranteed.

An altimetry manual is furnished with every W&T Altimeter. Also available is the W&T Palmer Altirule, a graphic computer for calculating elevations of field stations without computation when using the Two Base Method of Precise Altimetry.

WALLACE & TIERNAN PRODUCTS, INC.
ELECTRICAL MECHANISMS AND PRECISION INSTRUMENTS
Belleville 9, New Jersey • Represented in Principal Cities

A-91

S & R SPECIAL *Custom Built*
MUD CONVEYORS FOR DRILLING BARGES



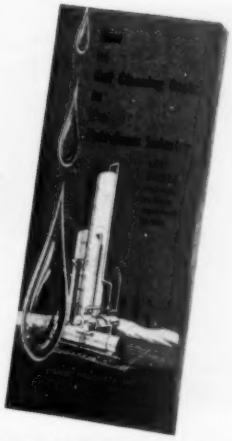
Pictured above electrically driven mud conveyor built by S & R for a major company.

Here's the answer to efficient movement of mud for your drilling barge—it's S & R's custom built, electrically powered, chain drive mud conveyor.

Built for heavy duty service with quality materials equipped with reversible belt, troughing idlers, protected easily accessible drive housing. Operates efficiently all positions to 35° off horizontal. Built in sizes to 40 feet.

Write, wire or phone for additional information

S & R TOOL & SUPPLY CO.
P. O. Box 1755 155 McCarty
HOUSTON 1, TEXAS
Export: 233 Broadway, New York 7, N. Y.



You get IDEAS in this **FREE** guide to faster, dollar-saving Maintenance cleaning

THAT handy Oakite booklet above gives you some excellent ideas on how to save money on maintenance cleaning. Describes procedures successfully performed by specialized Oakite methods. These tested methods are sure to help you save time and money on the many cleaning jobs you come up against in the production of petroleum products.

You Will Need This Booklet If These Jobs Are on Your Schedule

- **cleaning storage tank interiors**
- **paint-stripping Diesel engines**
- **descaling heat exchange equipment**
- **cleaning bubble towers and absorbers**
- **salvaging valves, piping**
- **cleaning tank cars: inside and out**

Ask your local Oakite Representative today for a FREE copy of the "Oakite Petroleum Booklet." Or send your request to us—Oakite Products, Inc., 44C Rector St., New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE
Technical Service Representatives in Principal Cities of U. S. & Canada

CONVENTIONAL CONTROL ROOM at the Llandarcy refinery differs little from any other modern control room. Versatility of electric operation is not utilized.

"CENTROLLER" CONTROL PANEL, now on order by Anglo-Iranian, results in smaller control room. Console is fabricated and tested in maker's factory.

Electronic Control at Llandarcy Refinery of Anglo-Iranian Oil Co.

Basic principles developed during World War II are being incorporated into control equipment for oil refineries

POSTWAR expansion plans of Anglo-Iranian Oil Co. called for the construction of a 3,400-bbl. per day SO$_2$ extraction unit for the treatment of kerosine, at Llandarcy, South Wales, Great Britain, refinery.

Instrumentation for this unit was planned by Evershed & Vignoles, Ltd., of Acton Lane Works, London. The controls department of this firm engaged in highly specialized electronic control work during the war. The basic principles perfected during that period were incorporated in the control equipment adapted for the refining industry.

Operation of the plant required 17 level, 4 flow, and 3 pressure controllers. The temperature recorders and controllers are conventional potentiometric instruments. The controlled values associated with the electronic controllers are recorded on a new form of milliammeter recorder, with circular charts conforming to the general design of instrument need in the oil industry.

New Control Room

The general appearance of the control room at Llandarcy differs little from that of any other modern control room, and the A.I.O.C. standard color scheme and panel dimensions were employed. No attempt was made to utilize the specialities and versatility of electric operation in this instance. This point is perhaps best illustrated by reference to the photograph of equivalent equipment, now on order, in which the control panel is in the form of a large desk or console specially designed for electrical operation.

The center section consists of a graphic panel of the plant on which is superimposed miniature indicators showing the levels, flows, pressures, and temperatures in the columns and pipe lines. The controllers are situated in the rear of the desk but the adjustments are displayed by raising the covering shutters on an angled facia below the diagram. Thus the operator is provided with a complete picture of the plant conditions and the means to control it from a seated position.

The side wings contain multipoint potentiometric recording and indicating meters, two of which produce permanent records, the others being used for detailed study of sections of the plant by selection of the measuring points.

Such a "Centroller," as it is termed by the manufacturers, is a logically assembly of the electronic equipment and

After two years of development and test work confirmed in the operation of the large West Texas installation pictured below,

HUDSON presents the

Combin-aire*

A New Type Cooling System Integrated for All Process Plant Cooling Services, Combining the Economical Maximum Use of Air With Minimum Use of Water.

In the COMBIN-AIRE the use of air for cooling is extended to include low temperature cooling services previously necessitating water cooling because of high ambient air temperature. The COMBIN-AIRE allows the use of air-cooling for total heat dissipation in all services.

The COMBIN-AIRE is a combination of a HUDSON water cooling tower with HUDSON air-cooled exchangers housed in one integrated structure. During periods of high ambient temperature the inlet air is first drawn through water at the bottom of the cooling tower, reducing the air to near wet bulb temperature, at which temperature it contacts the air-cooled exchangers. During periods of low ambient temperature the inlet air is used directly in the air-cooled exchangers and no water is evaporated in the cooling tower.

When water in good quantity and quality is not available the COMBIN-AIRE has manifest advantages over any alternative combination of cooling equipment.

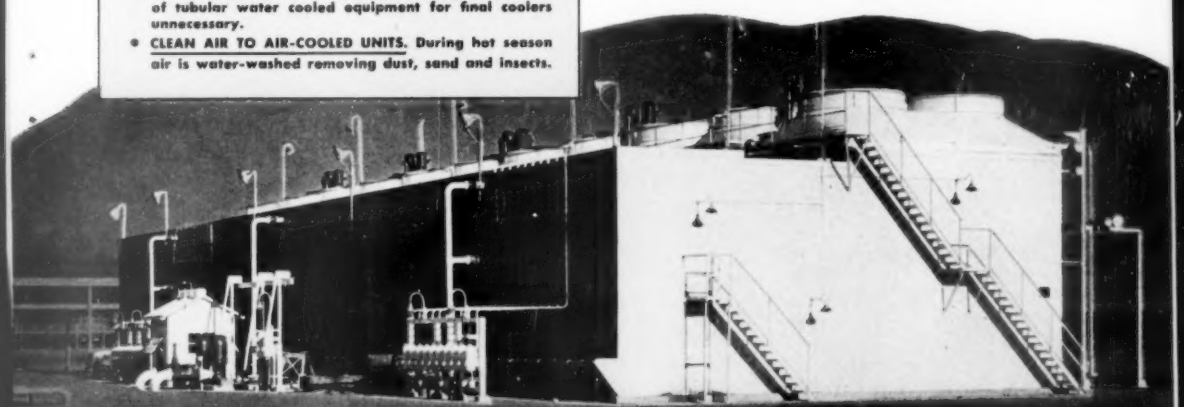
Even when ample water is available and water treatment costs are low, comprehensive comparisons will frequently indicate overall advantages of the COMBIN-AIRE system.

*** The COMBIN-AIRE unit is protected by United States patents**

COMBIN-AIRE ADVANTAGES

- **LOW WATER CONSUMPTION.** No water is used during cold weather.
- **NO TREATMENT NECESSARY** for cooling tower water.
- **NO WATER LOSS** as spray or mechanical carryover.
- **NO CONDENSATION** from effluent air.
- **MINIMUM PIPING.** COMBIN-AIRE may be installed immediately adjacent to other process equipment. Use of tubular water cooled equipment for final coolers unnecessary.
- **CLEAN AIR TO AIR-COOLED UNITS.** During hot season air is water-washed removing dust, sand and insects.

HUDSON
ENGINEERING CORPORATION
FAIRVIEW STATION • HOUSTON, TEXAS



This COMBIN-AIRE unit operated by the Plymouth Oil Company at [illegible] heat from all absorption and fractionating plant streams, a total heat load of about [illegible]

HUDSON

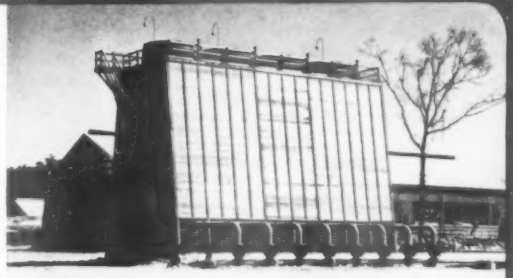
Top Performance

COOLING EQUIPMENT

For more than two decades HUDSON personnel have developed equipment for heat recovery and heat dissipation. Present day HUDSON cooling equipment has been evolved through the years by constant improvements in design and fabrication.

WATER COOLING TOWERS

Beauty and utility have been successfully combined in the HUDSON "TP" design. These Top Performance cooling towers embodying new but proven advancements in water cooling design, result in lower installation and operating costs for a given guaranteed performance.

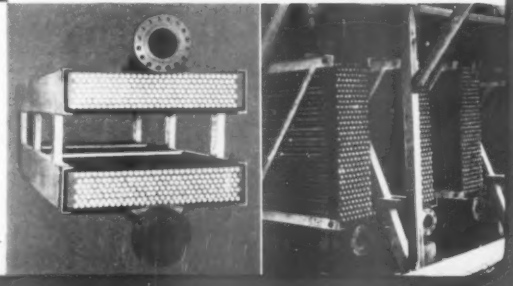


SOLO-AIRE UNITS

HUDSON SOLO-AIRE UNITS for jacket water cooling, gas cooling, steam condensing and hydrocarbon vapor condensing have found wide use, particularly where suitable cooling water is impossible or expensive to obtain. Even where adequate quality and quantity of water is available there are conditions under which these units have marked advantages over alternative cooling methods. Designs are available for pressures up to 5,000 pounds per square inch.

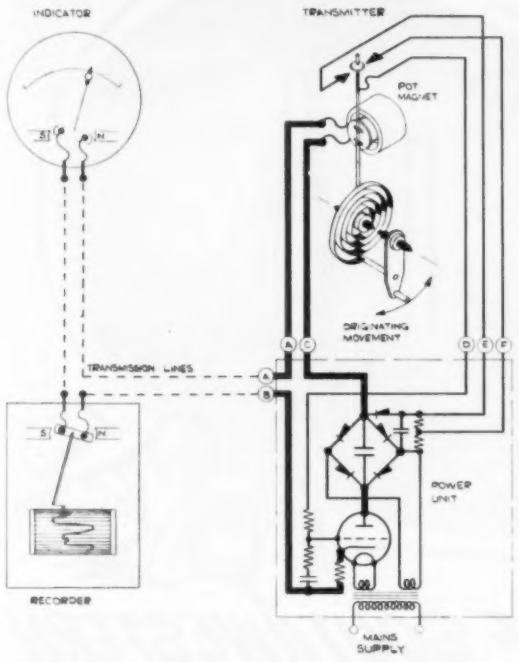
ATMOSPHERIC SECTIONS

These units are for use where water serves as cooling medium. They may be mounted vertically or horizontally, under cooling tower or submerged in water.

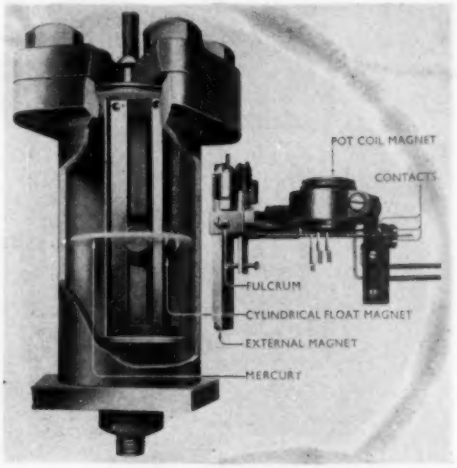


UNDIVIDED RESPONSIBILITY — Complete integration of facilities in selection, design and manufacture of cooling towers, water cooled atmospheric sections, and air cooled exchangers results in cooling systems of maximum heat exchange performance, and in undivided responsibility.

HUDSON
ENGINEERING CORPORATION
FAIRVIEW STATION • HOUSTON, TEXAS



MECHANICAL TRANSMITTER operating indicator and recorder—Fig. 1.



"ROLLFLOW" meter—Fig. 2.

brings to the oil industry the style of the supervisory control equipment which has long been used for electric power networks.

In fact, the absence of time lags and distance limitations opens up new possibilities in refinery practice by the interconnection of units which at present are separate entities. It is possible to visualize refining as one multiple cascaded process having one central control room.

Apart from the simplification of having all controls within arm's reach of the operator, the console development has two very important advantages. First, the size of the control room required is considerably reduced, and secondly, the console can be fabricated and tested as a complete unit in the maker's factory with all instruments and wiring in place ready for transportation to site where it can be set down on the floor of the control room with no additional site work required, other than to link it up to the external connections.

Three further process units for A.I.O.C.'s refineries in the United Kingdom are also being equipped with console-type control desks of a similar pattern.

Transmission System

The new equipment also provides an electronic transmission system for the remote indication of measured variables to the controllers and recorders.

The telemetering system used has been proved in service over many years by utility companies for indicating various quantities in their networks, often over distances of many miles. These telemeter systems employ a "transmitter" which converts a force due to a measuring instrument into a proportional electric signal, usually a continuous direct current.

The electronic repeater provides a complete range of transmitters for all process quantities, with rugged construction in noncorrosive materials to suit the arduous conditions of this field.

The major development has been the three-term process controller which, accepting a signal from a transmitter, gives an electrical output corresponding to the magnitude, the integral, and the derivative of the deviation by means of further applications of the repeater principle which is described below.

Transmitter operation . . . In the arrangement shown in Fig. 1 a small force due to an originating measuring element (such as a pressure gage or a float for level measurement) is applied by a helical spring link to a pivoted arm which carries a coil operating in the air gap of a pot magnet. The coil arm carries a disk contact connected to the grid circuit of a thermionic valve and is free to move between two fixed contacts connected to sources of positive and negative bias.

The coil is connected in the anode circuit of the thermionic valve, the circuit being completed by the transmission line containing indicators, recorders, and controllers as required. The system operates as a continuous force balance, the contact assembly modifying the valve anode current until the force due to the coil and pot magnet balances the force due to the originating movement.

This force need only be very small and advantage is taken of this fact in certain measurements e.g., in the Rollflow transmitter where a magnetic link is used in place of the conventional spindle gland and stuffing box. The positive chamber of this mercury manometer flowmeter is shown in Fig. 2. The mercury level is detected by a cylindrical floating magnet, within the chamber, and an external strip magnet which is pivoted at a height corresponding to the zero of the flow meter.

The differential pressure decreases the level of mercury and a force proportional to this pressure is applied to the coil and magnet system of the repeater. The balancing current so caused varies as the differential pressure, which is itself proportional to

A NEW PICTURE OF SOUTHWESTERN

REFINERY ENGINEERING Company is proud to have been chosen by SOUTHWESTERN OIL and REFINING COMPANY to modernize their plant at Corpus Christi, Texas.

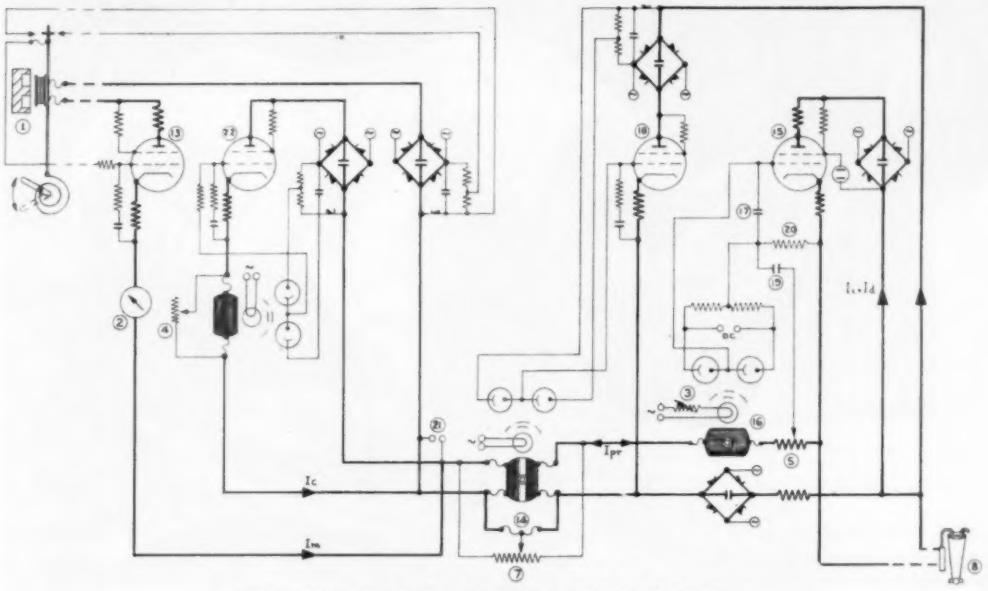
The contract calls for the construction of a Universal Oil Products Company Catalytic Cracker, Gas Concentration Unit and Polymerization Units and Product Treater. Designed capacity will be 5,740 barrels gas oil charge per day at 50% conversion. The plant will burn 4,350 pounds of coke per hour at designated throughput.

The two most common bottlenecks encountered, when increased production is desired, have been eliminated by making the initial capacity of the blower 30% greater than required for the carbon burned at design conditions and installing a fractionating column one foot larger in diameter than required for design capacity. At a later date throughput can be increased to the ultimate capacity of the blower and tower by changing pumps and adding heat exchange surface.

Call on Treco for a discussion of your refining problems and requirements. You will find that our constantly expanding staff of engineering, design, construction and operating men can give you the correct answers and show you how to save time and money. Treco plants are designed to give you the utmost in efficiency and flexibility at a minimum of cost.

REFINERY ENGINEERING *Company*

PHONE 5-5561 • TULSA, OKLAHOMA



CIRCUIT DIAGRAM for Evershed electronic controller MK II—Fig. 3.

the square of the flow. Thus a milliammeter in the circuit can be calibrated as a flow meter, the scale shape having a square law characteristic.

It is important to note that if the pot magnet is replaced by an electromagnet connected in series with the balancing coil, the current will bear a linear relationship with the flow since the balancing force will vary as the square of the current. Such an arrangement is extremely useful when integrating and for other purposes. This recent development, although not employed at Llandarcy, has since been incorporated in later units for A.I.O.C.

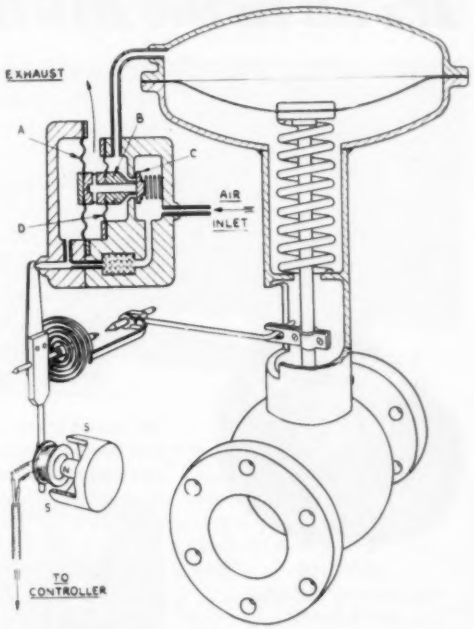
The quantity of mercury in the manometer is not critical since the flow meter can be zeroed by raising or lowering the whole external assembly. A further magnetically operated pointer (not shown in the illustration) is provided for local indication—a facility which is provided on all transmitters so that the quantity may be observed at the transmitter independently of the electric supply.

The repeater circuit is independent of quite large changes in the line supply voltage, the frequency, the resistance of the circuit, or the thermionic valve characteristics because a force balance system is employed.

Safety . . . When electrical apparatus is used in locations subject to fire or explosion hazards it is generally necessary to enclose the equipment in "flameproof" enclosures. By this is meant an enclosure sufficiently robust to withstand an internal explosion without transmitting it to the surrounding atmosphere. There is, however, an alternative applicable to instrument practice, namely "intrinsic safety." To obtain such certification it is necessary to limit the electrical quantities to such small values that any resulting spark is innocuous.

The electronic repeater transmitters, receivers, and pilot wire circuits are certified as intrinsically safe in pentane and allied vapors, and the instruments may be opened at any time without special precautions. The signal current varies from 0-30 ma. d.c. for the full range of measurement and telephone-type multicore cable is employed for the connections.

The power units which contain the thermionic valves are connected directly to the supply mains and some form of safety enclosure is necessary.



REMOTE ELECTRIC CONTROL of air-operated valve—Fig. 4.

in WIRE ROPE, too

It's all in the RIGHT KIND of Muscle

The powerful, rugged muscles of a charging rhino enable him to propel his tremendous bulk and weight at truly remarkable speed. Nature designed them well for the purpose they have to serve.

In wire rope, too, the right kind of muscle is vitally important... because different types of jobs present different types of destructive forces. Bending fatigue! Shock stress! Abrasion! Load strain! Each demands wire rope that best combines the required resistance characteristics.

Wickwire Rope gives you the benefit of long experience and specialized know-how which assures you of exactly the right kind of rope your particular job demands.

For additional information write or phone our nearest sales office.

LOOK FOR THE YELLOW TRIANGLE ON THE REEL

EAST: WICKWIRE SPENCER STEEL DIV.—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • Philadelphia • New York
WEST: THE COLORADO FUEL & IRON CORP.—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST: THE CALIFORNIA WIRE CLOTH CORP.—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION

When used for control, the unit is an integral part of the controller itself, which has a flameproof case. This equipment is situated on the control-room panel, as is the normal practice with electrical potentiometric recorders.

It is now proposed to describe briefly the operation of the controller, the basic circuit diagram of which is shown in Fig. 3. It will be appreciated that a moving coil galvanometer could be used for the force balance in place of the pot coil and magnet assembly described above and that a light beam and photocells could form the balance detector instead of contacts. Such a photoelectric galvanometer is referred to as a "relay" in the following description.

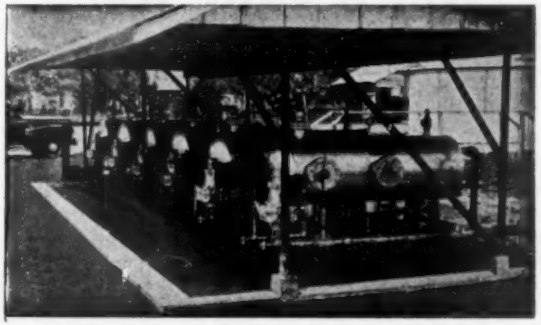
The transmitter (1) in conjunction with the valve (13) produces a current in representing the value of the controlled condition which is indicated on the meter (2). The "desired value" at which it is desired to stabilize the process is represented by Ic derived from valve (22) using a spring-controlled relay. The value of Ic is set by the variable resistance (4) which has a suitability calibrated knob. These two currents pass in opposition through one winding of galvanometer (14), which will deflect according to the magnitude of the error in the system. Such deflection modifies the distribution of light between its photocells and consequently the grid voltage on thermionic valve (18) until its anode current Ipr which flows through the second coil of (14) rebalances the relay. This current Ipr is proportional to the error, the sensitivity being determined by the variable shunt resistance (7) which is calibrated for 2 to 600 per cent "proportional band."

The current Ipr, may itself be used for proportional control or it may be further integrated and differentiated electrically to provide "2 and 3 term" control. For these terms it is necessary to obtain a signal which varies in magnitude and direction according to the error. This applies in relay (16), the current Ipr being biased into a bi-directional form by the rectifier circuit shown below that relay. The photo cells of this relay form two arms of a current bridge. The presence of an error causes an unbalance of light and consequently a change in the emission of the photo cells. The condenser (17) therefore becomes charged according to the integral of the error with respect to time. The rate of integration is determined by the light intensity and the variable resistor (3) is calibrated for an integration period of 0.2 to 60 minutes.

The rate of change of the error is gaged by the circuit formed by resistors

ROLO WELLCHECKERS

PERMANENT AND PORTABLE SEPARATORS FOR METERING OIL AND GAS



This battery of six skid-mounted 4-1H-2406 Rolo Wellcheckers makes it possible to produce six one-well leases into a single tank battery. Installations of this type, of which Rolo Mfg. Co. has made many, are approved by regulatory bodies. Let us work with you on your problem.

Rolo Wellcheckers are made in all sizes to fit any operation. See Composite Catalog or write for illustrated bulletin.

Crude Oil Metering Specialists

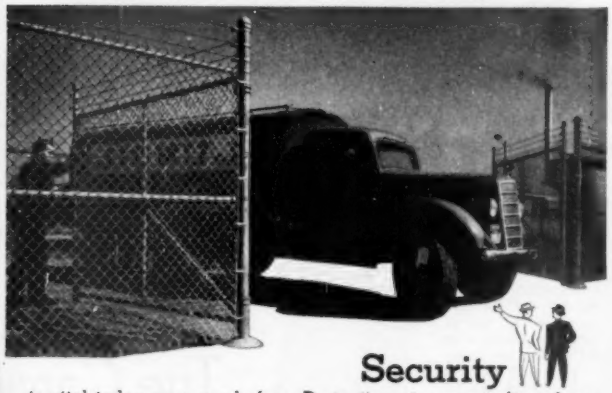
MANUFACTURING COMPANY

2510 South Blvd., Houston 6, Texas

Branches: Corpus Christi, Midland, Kilgore, Tulsa, New Orleans, Los Angeles, Casper, Calgary (Alta),
Petroleum Industry Consultants, Apartado 1953, Caracas, Venezuela
Export Office: R. S. Stokvis & Sons, Inc., 17 Battery Place, New York, N. Y.

PAGE FENCE *-Since 1883*

• AMERICA'S FIRST WIRE FENCE •



Security

is vital today as never before. Protection at property lines has been the responsibility of Page Chain Link Fence for more than 60 years. There are fence styles and gates to meet any protective need. The expert erecting firm near you will supply facts and submit cost estimates without obligation. Firm name will be sent with fence data on request.

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Los Angeles, Philadelphia, New York or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

Get a Line on Canadian Oil

Opportunities are big in Canada's Western oil and gas fields . . . but all opportunities present problems. Solving these problems, and at the same time offering complete, on-the-spot banking facilities, is a big job of The Canadian Bank of Commerce. More than 140 branches are located in the sedimentary basin of Western Canada. A special "banker-geologist" team is staffed by men with long experience in financing problems peculiar to the oil industry.

If you want help with any phase of Canadian oil and natural gas, turn to The Canadian Bank of Commerce.

Canada's potential oil area is larger than the combined states of California, Texas, Oklahoma, Kansas and Louisiana . . .

Our Brochure "For Oil and Allied Industries" is a *must* for any oil operator interested in the Canadian producing picture. It contains up-to-date information on such vital matters as taxes, leases, customs regulations, etc. Write for your copy today to

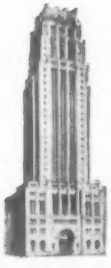
Petroleum and Natural Gas Division
The Canadian Bank of Commerce
809 Centre Street
Calgary, Alberta

The Canadian Bank of Commerce

HEAD OFFICE: TORONTO

New York San Francisco Los Angeles Seattle Portland, Ore.

More than 600 Branches across Canada



(5), (20) and capacitor (19). A voltage proportional to the error appears across resistor (5). Whenever the error changes, a current flows via resistance (2) in order to modify the change on capacitor (19). The voltage developed across (20) is therefore a measure of the derivative of the error over a period determined by the value of resistance (5) which is calibrated for 0-10 minutes derivative time.

The voltage appearing across the resistor (20) and condenser (19) are applied to the grid of thermionic valve (15) whose anode current $I_b + Id$ is added to Ipr to form the three term output of 0-15 mA.D.C.

A hand control circuit (not shown in the diagram) is provided for manual control during a startup and during servicing of the equipment. Cascade control is possible by injecting the output of a further controller into the desired value circuit at the terminals marked (21). In the Llandarcy installation a flow controller is reset by a column level controller in this manner.

Pneumatic valves . . . In order to employ the diaphragm control valves which are standard in refinery practice, it was necessary to develop a valve positioner to translate the electric signal from the controller into valve position, using air pressure as the motive power. This device is shown in Fig. 4, the current being applied to a pot coil and magnet assembly as previously described. The coil is mounted on a pivoted beam which also carries a flapper operating in conjunction with the nozzle of a low-bleed type air relay, the output of which is fed to the diaphragm head of the control valve.

The turning moment of the beam is controlled by a helical spring whose outer end is coupled to a feed-back lever driven by the valve stem, so that, in the steady state, the force due to the electric current is balanced by a force due to the valve position. Valves B and C in the pneumatic relay are then closed.

Should the controller output current rise, the flapper will move and cause an increase in pressure on diaphragm A of the relay. The plunger B opens valve C to admit air to the diaphragm head. Similarly if the current decreases, a decrease in pressure on A causes the plunger B to exhaust the valve head to atmosphere until the new valve position restores the flapper to its normal position.

The advent of such equipment demands suitably trained maintenance personnel, and consequently various members of the refinery staff visited the manufacturers' works in order to gain familiarity with the equipment.

Removable units . . . Considerable use is made of ease of connection of electric circuits by plugs and sockets to enable the servicing by replacement.

In particular, the electronic components of the controller are arranged on two removable "trays" to minimize the out-of-service time during a fault. The tray taken out of service is replaced by another and may then be examined and tested in the instrument repair shop at a convenient time.

Process analogue . . . To facilitate testing, a device known as a process analog is provided. In this, the capacities and time lags of a process plant are simulated by electrical networks, and with its aid, the complete operation of a controller may be rapidly tested while various plant disturbances are simulated and repeated at will.

The SO_2 plant has been in operation for some 9 months and apart from a few relatively minor mechanical diffi-

MERCOID

• ALL MERCURY SWITCH EQUIPPED • AUTOMATIC CONTROLS •

These controls are used extensively on various applications in the oil field

If you have a control problem—involving the automatic control of pressure, temperature, liquid level, mechanical operations, etc.; it will pay you to consult Mercoid's engineering staff—always at your service.

WRITE FOR CATALOG 700—PLEASE MENTION THIS PUBLICATION

THE MERCOID CORPORATION
4201 BELMONT AVE. CHICAGO 41, ILL.

Progress in Steel . . . *Means More Sheet and Strip*

The huge steel skeleton above is the beginning of one of several structures being built to house the new 66-inch Sheet-Strip Mills at the Pittsburgh Steel Company's Allenport Works. From these mills will come hot and cold rolled sheets to supply this vital material to manufacturers of a multitude of defense items and civilian goods.

The construction of these new mills is an important part of Pittsburgh Steel's Program of Progress which has as its objectives increases of 82% in finished product capacity and 50% in ingot capacity. It includes the acquisition of the Thomas Steel Company, now operating as the Thomas Strip Division, the installation of the new 66-inch High Lift Blooming-Slabbing Mill, which will roll slabs for the new Sheet-Strip Mill. Blast Furnace and Open Hearth capacities are also being greatly increased. All this is being done to expand production and diversify the Company's line of wire, tubular and flat-rolled products in order to serve customers better.

This Program of Progress at Pittsburgh Steel Company is typical of the activity in the steel industry which daily grows larger and stronger in order to help keep this Nation's commanding position in the world. For it is only with an adequate supply of steel that we can defend ourselves from aggression—maintain a high level of civilian economy as well.

Pittsburgh Steel Company

Pittsburgh, Pennsylvania

culties has given little or no trouble. The control instruments have functioned excellently right from the start and have amply justified the hopes which were placed in them.

Solidification of Lime-Treated Muds

(Continued from page 266)

prepare a mud consisting of 120 lb. of shale and 8 lb. of sodium hydroxide per barrel of water. One portion of the mud which was allowed to stand at 75° F. for 16 hours appeared to be unchanged. Another portion, heated at 300- F., was plastic. Neither was hard.

Results of X-ray diffraction measurements show that the sample stored at 75° F. did not differ noticeably from the untreated shale. In contrast, the sample heated at 300° F. showed a marked decrease in quartz, some reduction in clay, and the presence of analcite ($Na_2O.Al_2O_3.4SiO_2.2H_2O$).

Muds containing lime were then prepared for X-ray analysis. Wyoming bentonite and Glen Rose shale were used with caustic soda, lime, and both caustic soda and lime. The samples were aged 4 days at 250° or 300° F. All muds containing lime were hard after aging. The bentonite mud treated only with caustic soda was fluid and the shale mud containing caustic soda was plastic.

Results of the X-ray analyses are shown in Table 3. As in the first test, quartz was removed by action of the caustic soda. Clay content was reduced and analcite was formed. Attack on the montmorillonite was far more extensive in samples containing lime. Again, analcite was formed. Some amorphous material was present in the samples heated with the bases. Some poorly crystalline hydrated calcium silicate product was present which might have been xonotlite ($5CaO.5SiO_2.H_2O$).

In an attempt to identify the reaction product, a lime - bentonite slurry containing more than three times the quantity of lime equivalent to the silica and alumina present in the montmorillonite was heated 24 hours at 300° F. An X-ray analysis of the resulting material was made. The montmorillonite had disappeared and the lines attributed to xonotlite were more intense than on the earlier samples.

Evidence has been presented to show that caustic soda and lime react with the clay minerals and silica to form hydrated alumino-silicates and silicates. These products resemble to some extent those involved in the setting of cement. The clay minerals are attacked by bases at normal temperatures but the rate is accelerated at the higher temperatures found in deep holes. A frequent observation in the field has been that with prolonged use of high-pH mud becomes more difficult to control. It has been noted also that a lime-treated mud which becomes stiff on standing in the hole can be replaced by a freshly prepared mud composed, insofar as is known, of the same ingredients, and operations can be continued for a time without difficulty.

The first stage in the stiffening of a limed mud is the development of a gel structure which is not destroyed by stirring. The stirred mud may have a grainy appearance and small lumps may be removed by screening. On further heating, a more rigid structure develops and, if the concentration of cementing materials is sufficient, all of the liquid is retained in the solid mass. The quantity and composition of the

A Shell Photograph

Kenyon provide a *complete* thermal insulation service to the oil industry, including technical advice on thermal insulation specifications, and finishes for all conditions. Supply of materials, application, supervision, on sites throughout the world. The photograph shows columns on the Distillation Unit, M.E.C. project at Ellesmere Port, Cheshire.

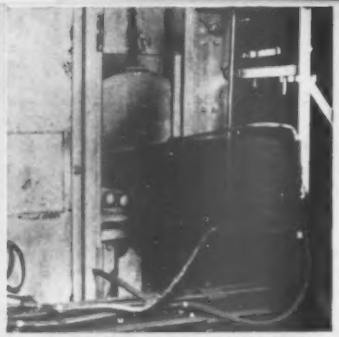
Call in KENYON to keep the heat in!

WM. KENYON & SONS (AMERICA) LTD., PERTH AMBOY, N.J., U.S.A.

WILLIAM KENYON & SONS LTD., DUKINFIELD, CHESHIRE, ENGLAND

KH 132

The
TIMKEN
Company
Improves TUBE
MILL Operation
With the
DIAMOND "UTILISCOPE"
(WIRED TELEVISION)



"Utiliscope" Camera looks directly into furnace at charging end.

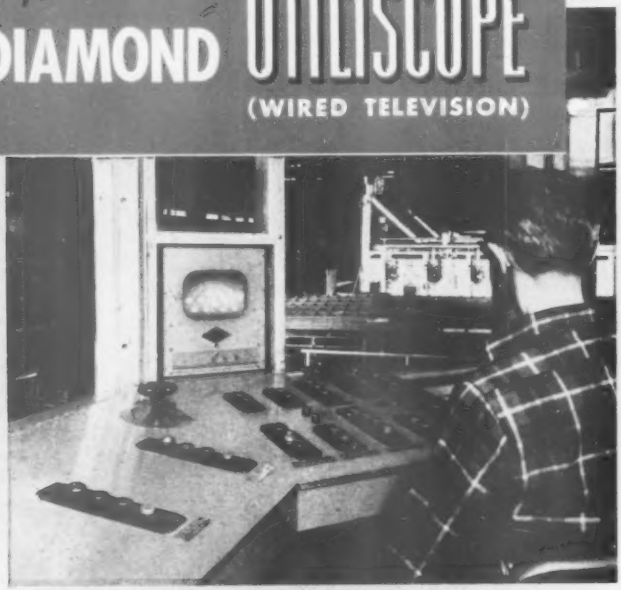


Image of furnace interior on "Utiliscope" viewing screen, right in front of dispatcher 80 feet away.

In a seamless tube mill of The Timken Roller Bearing Company, both the mill and the heating furnace are controlled by a single dispatcher. Tubes are automatically fed into the furnace sidewise . . . travel through on a conveyor. To watch both the mill and the furnace, the dispatcher must be about 80 feet from the furnace charging end.

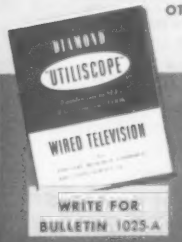
Formerly a second man was required at the charging end to avoid tube "pile ups" in the furnace. Now a Diamond "Utiliscope" (Wired Television) Camera looks directly into the furnace . . . the image is brought to a viewing screen right in front of the dispatcher. It's easy for him to maintain even furnace feed and avoid "pile ups."

This is one of many examples of improved operation with a saving in cost that has been made by using the "Utiliscope". For further information, write for Bulletin 1025-A.

OTHER USES include studying destructive tests of engines, checking remote gauge readings, viewing nuclear research, etc.

The "Utiliscope" Reg. U. S. Pat. Office.

4826



WRITE FOR BULLETIN 1025-A

DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO • OFFICES IN 39 PRINCIPAL CITIES
Diamond Specialty Limited — Windsor, Ontario
Since 1903, Diamond has Manufactured Quality Equipment For Industry

suspended solids affect the rate of development and the strength of the gel structure. Development of the gel structure is affected, among other things, by the organic thinner present in the mud. As has been pointed out, the concentration of organic thinner appears to decrease as the mud sets.

Remedial Measures

Because of the extreme variation in quantity and character of solids in the mud, the degree and type of contamination by soluble salts from the make-up water and the formations drilled, and the previous history of chemical treatment, no cure-all can be recommended. The usual remedial measures serve to retard, rather than to eliminate, the stiffening of lime-treated muds in hot holes. In general, good practice demands that careful attention be paid to maintenance of adequate concentration of organic thinner, moderate alkalinity and minimum clay content.

At times, the mud best satisfying the requirements for making hole may lack the stability of heat necessary to permit free entry of logging and testing tools after circulation has been stopped for some time. In such cases, that part of the mud to be left in the lower section of the hole may be heavily treated with organic thinners, or a small batch of mud having the needed stability may be prepared and pumped into the hole.

The organic thinners used to lower viscosity of muds are effective in retarding thickening of limed muds but, as is true with viscosity reduction, the same thinner is not always the most effective. Lignite may be better than quebracho or calcium lignosulfonate for one mud and inferior with another mud. On some muds, quebracho and lignite together work better than either separately. A number of substances which retard the setting of cement have been found in laboratory tests to delay the thickening of limed muds. Among these products are sucrose, dextrose, fumaric acid, citric acid, mucic acid, maleic acid, karaya gum, arabic gum, and gelatin. None has demonstrated any superiority over the mud thinners which are readily available in the field.

References

1. Cannon, G. E., The Oil and Gas Journal, 101, May 3 (1947).
2. Lancaster, E. H., and Mitchell, M. E., Trans. A.I.M.E., 179, 357 (1949).
3. McCray, A. W., Petroleum Engineer, B-54, Nov. (1949).
4. Goins, W. C., Jr., The Oil and Gas Journal, 52, Jan. 19 (1950).
5. Battle, J. L., and Chaney, P. E., A.P.I. Drilling and Production Practice, 99 (1950); World Oil, 101 April (1950).
6. Gray, G. R., Cramer, A. C., and Litman, K. K., World Oil, 149, Aug. (1951).

They're DROP FORGED

of STEEL...

W-S Screw-End and Socket-Weld Fittings

There are several big benefits to you implied in this simple statement of fact about W-S Fittings.

First, forging means *strength*—the strongest, most compact physical form, steel for steel, obtainable by commercial methods of fabrication.

Second, *being* stronger, forged fittings are much *smaller* and *lighter*, size for size, than other types.

Third, *dimensional accuracy* is characteristic of the forging process—and because forged bodies *are* more accurate, they chuck better, can be machined to *closer*, more *uniform tolerances* than other types.

To these inherent advantages of *forged* fittings, add Watson-Stillman's modern manufacturing facilities, a production control system that's air-tight from furnace to finished product, and a sales engineering staff dedicated to SERVICE in the largest sense of the word. The total is heavily weighted in favor of the advantages of W-S Double-Diamond Forged Steel Fittings.

• Lower Service Cost • More Uniform
• Stronger • Smaller • Lighter • Tighter

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

WATSON-STILLMAN
ESTABLISHED 1848

W S

9-56-1

DISTRIBUTOR PRODUCTS DIVISION

ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

Distillation, Absorption, And Extraction Column

(Continued from page 271)

be desirable to drill a few small-diameter weep holes in plate K so that the plates will drain upon shutdown.

In the tube G shown in Fig. 1, much of the mass transfer takes place. The design of this tube is not limited to the simple half-turn type as shown. It may be a coil either horizontal or vertical with the opening H turned to face toward plate K. It is also possible to operate without tube G. If it is removed, it is advisable to place a deflector plate or cap above the venturi so that the continuous and entrained phases strike this deflector plate; it will then deflect the entrained phase back toward plate K.

It is, of course, not necessary to have tube G directly above liquid tube P as shown on Fig. 1. The tubes O and B need not be in the center of the plate K as shown but may be offset from the center.

In the case of distillation columns it may be desirable to have the mixture of liquid and vapor after leaving tube G to be directed into a short length of efficient packing[1,2,3] to cause many of the small liquid droplets to coalesce into larger droplets. In addition to reducing the load on the entraining separators D, E, and F, this short length of packing will also provide area for additional mass transfer and it will prevent the high-velocity stream emerging at G from "blasting" the liquid off plate K.

For large-diameter columns the vapor stream can be throttled through more than one tube G although only one liquid downcomer would be required. It is also possible to have a series of throttling tubes J, in parallel, leading into G. The reason for this is to maintain the diameter of the throttled vapor stream relatively small since this factor influences the rate of mass transfer.

Control of Flow Direction

In the usual pipe or conduit a fluid generally flows from a point of high static pressure to a point of lower static pressure. However, it is possible to reverse this by proper design and have the fluid flow from an area of low static pressure to one of higher static pressure. This is so, because flow direction is not determined by static pressure but by the sum of static and velocity pressure.

Thus, if the sum of static plus velocity pressure is greater at point A than at some other point B then flow will be in the direction from A to B regardless of what static pressure at these points might be.

These facts may be experimentally illustrated in the laboratory by the simple piece of equipment shown as Fig. 4. This unit employs a glass pipe—a convenient size would be 4 in. i.d. and 3 ft. long. A and B may be two different liquids miscible or immiscible or they may be the same liquid.

For example, consider water at room temperature in each case, with stream A containing some dye and stream B no dye. Start up the equipment with stream B flowing with a velocity such that it leaves the contracted jet with a velocity of 48 ft. per second or more. It will then have a velocity pressure of approximately 15.5 psi. Then start up stream A and bring its velocity up to 48 ft. per second or more at the jet, so that sufficient velocity pressure is generated to drive it through the pipe.

It can then be seen that the same fluid is being pumped in two different

Explosion Proof
JUNCTION BOXES
for class 1, group D hazardous locations

Nelson Class 480 Explosion-Proof Cast Iron Boxes are designed for use as junction boxes and equipment enclosures in Class 1, Group D Hazardous Locations. Note these desirable features:

The castings for these boxes are made from a fine grade of gray iron and are produced in our own Foundry.

Flange joints are ground carefully to insure minimum clearances between the flange faces. Mounting lugs are machined. Cover bolts are rust-resisting plated.

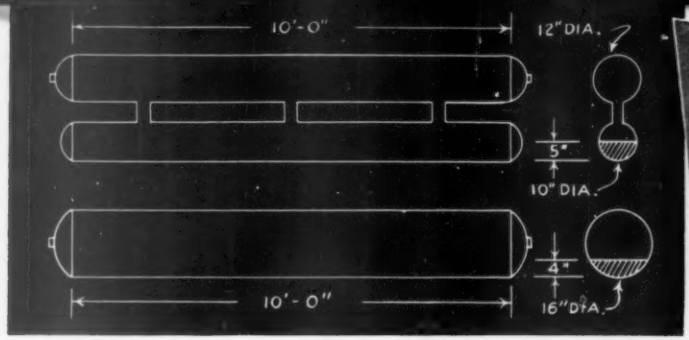
Boxes are available in a wide selection of sizes, and are furnished in two types: with inside flanges, and with outside flanges.

If desired, we can also furnish our Class 481 Explosion-Proof Junction boxes which contain low voltage busses and connectors (600 volts and less).

WRITE FOR DESCRIPTIVE BULLETIN 480

NELSON Electric MANUFACTURING CO.

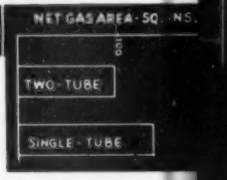
217 North Detroit TULSA, OKLAHOMA Telephone 2-5131



The Case in Favor of PARKERSBURG Single Tube Horizontal Separators

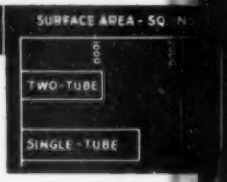
● The Parkersburg large Single Tube Horizontal Separator provides greater separating efficiency and other specific advantages over comparably priced double tube horizontal separators of equal nominal rating. These facts are substantiated by the accompanying area and capacity drawings of the two types of horizontal separators.

1. LARGE SINGLE TUBE PROVIDES GREATER AREA FOR GAS FLOW



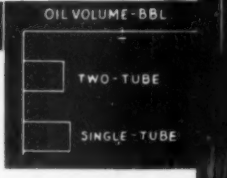
Reference to graph No. 1 shows the 16" single tube separator to have over 20% more gas area above the 4" fluid level than in the upper tube of the two tube separator. The velocity of gas in this larger area is therefore as much as 20% lower than in the top tube of the two tube separator. Consequently, separation of entrained liquid is more effective.

2. LARGE SINGLE TUBE HAS GREATER LIQUID SURFACE AREA



Our graph No. 2 shows the surface area is over 25% greater in the single 16" tube than in the bottom tube of the two tube separator with oil levels as indicated by the two cross-section drawings. As a result of this greater surface area, the oil comes into equilibrium more quickly and remains longer. Foam is more rapidly dissipated. Degassing of the oil is more thorough and complete under these conditions.

3. LARGE SINGLE TUBE PROVIDES LONGER RETENTION TIME



The volume of oil retained in the large single tube Parkersburg Horizontal Separator is greater, at any given rate of flow, than in the two tube separator. The retention time is therefore greater, giving the oil more time to give up its gas. This is particularly important where foam exists and a layer of foam on top of the oil interface retards liberation of gas from the oil.

Other specific advantages of the Parkersburg large Single Tube Horizontal Separator are: Retention of gas in same tube with oil keeps the oil warm, and therefore the water warm, so that Parkersburg Horizontal Separators withstand lower atmospheric temperatures without danger of water freezing. With the single tube, there is only one tube to clean out. This single tube has three drains, and is open all along the bottom for a depth of about 2", to provide a clear area for forcing out mud and accumulation.

Ask your Parkersburg Representative for additional data about Parkersburg Horizontal Separators — or write for latest bulletin.

No. 5205

PARKERSBURG
PRESSURE EQUIPMENT

HORIZONTAL AND VERTICAL SEPARATORS • HYRECO • HYDRACEPTER • SCRUBBERS • TREATERS • HEATERS

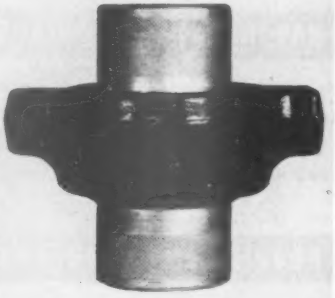
Manufactured in Houston, Texas

•FOR HIGH PRESSURE CONNECTIONS

TOOLPUSHER
"WECO 600's last longer in rough services."

DRILLER
"Fig. 600 makes up faster and seals better than any union we've ever had."

WE GO for WECO
Fig. 600 UNIONS



This Union is ideal for pump manifolds—blowout preventer lines—mud lines—stand pipe connections—high pressure separator lines and other high pressure connections.

The replaceable bronze seat prolongs its use far beyond the normal service life of ordinary unions. It assures a seating surface unimpaired by rust on lines involving condensation.

For maximum service—longest life, specify WECO FIG. 600 UNIONS.

SOLD EXCLUSIVELY
THROUGH SUPPLY STORES

WECO Fig. 600 Unions
6000 lb. Test
Sizes 1", 1½", 2", 2½", 3", 4",
Dizzy* Thread

*T. M. Reg.

It's Wise to Standardize with... WECO...

WELL EQUIPMENT MFG. CORP.
Division of Chiksan Company
HOUSTON 1, TEXAS
*, Exclusive Sales Representative Outside Mid-Continent Area
CHIKSAN COMPANY
Brea, Calif. Chicago 2, Ill. Newark 2, N. J.
Export Sales: CHIKSAN EXPORT COMPANY, Brea, Calif. Newark 2, N. J.

Manufacturers and Distributors of Oilfield, Refining, Marine and Industrial Equipment

directions in the same pipe simultaneously. Pressure gages P_1 and P_2 will each have a finite reading but they do not give any clue as to flow direction since they are measuring static pressure whereas in this particularly piece of equipment the important property is velocity pressure. There will be some mixing of stream A with stream B because while stream A leaves the jet with a high-velocity pressure and a reduced static pressure there is a partial reconversion of velocity pressure to static pressure as it flows.

Consequently, as stream A approaches the B stream jet it has a higher static pressure than the B stream and since flow at right angles to stream direction (in which direction velocity pressure is zero) is dictated by static pressure difference it follows that some mixing will occur but the bulk of stream A will flow in one direction and the bulk of B in the other.

The purpose of this suggested experiment is to show that, in special cases where velocity pressures are high, readings on static pressure gages have no meaning—in fact, in the experiment just described the flow can be in two directions at the same time.

Nomenclature

X_1 = vertical difference in height between reference Point 1 and any horizontal plane of reference.

X_2 = vertical difference in height between reference Point 2 and the same reference plane.

P_1 = static pressure at reference Point 1.

P_2 = static pressure at reference Point 2.

V_1 = specific volume of the fluid at reference Point 1.

V_2 = specific volume of the fluid at reference Point 2.

$\int PdV$ = work of expansion of compression occurring between reference Points 1 and 2.

W = energy delivered to fluid from an external source (such as a pump) between reference Points 1 and 2.

U_1 = lineal velocity of the fluid at reference Point 1.

U_2 = lineal velocity of the fluid at reference Point 2.

ΣF = summation of all friction generated between reference Points 1 and 2.

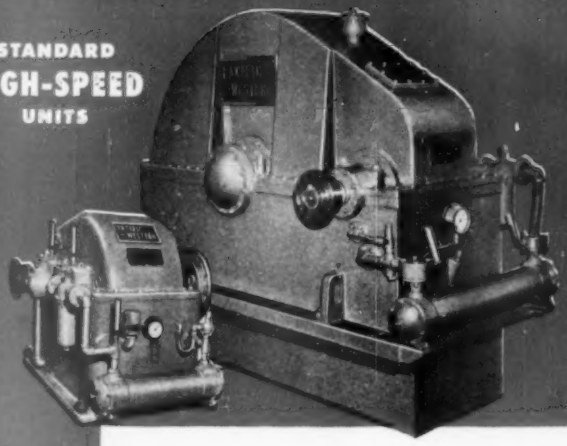
P_v = velocity pressure.

ρ = fluid density at point in question.

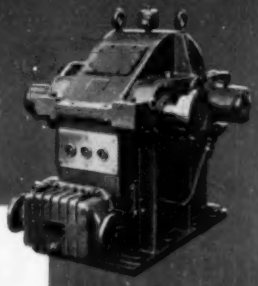
References

1. Cannon, M. R., "A New Distillation Packing," Ind. Eng. Chem. 41, 1953 (1949).
2. Heinlein, A. C., Manning, R. E., and Cannon, M. R., "Distillation in 2, 4, and 6-In. Diameter Columns," Chemical Engineering Progress, 47, 344 (1951).
3. Peters, Max, and Cannon, M. R., "Vacuum Distillation." Paper presented at Twelfth International Congress of Pure and Applied Chemistry, Sept. 13, 1951, New York City.

STANDARD
HIGH-SPEED
UNITS



SPECIAL
HIGH-SPEED
UNITS



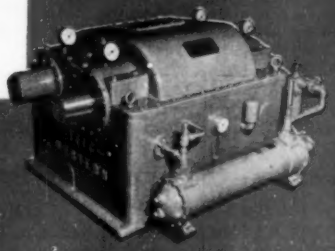
GEAR DRIVES

for every type of pumping service

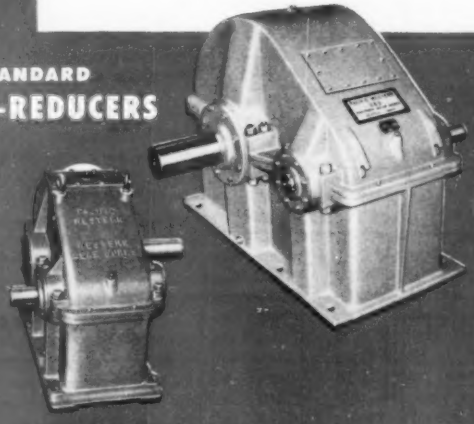
Complete service to the Petroleum Industry by Western Gear Works includes the design, production, testing and application of all types of gear drives.

WESTERN GEAR

"Good Gears Since 1888"



STANDARD
SPEED-REDUCERS



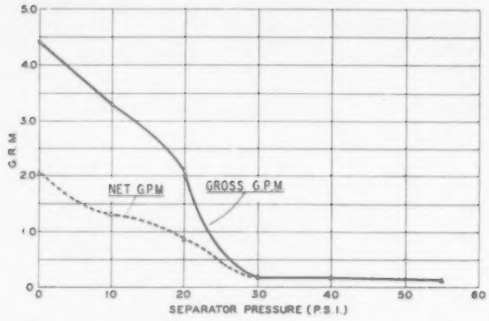
New Catalog Available—
Write on your letterhead
for Bulletin 5204

Write, wire or phone your nearest Pacific-Western office.

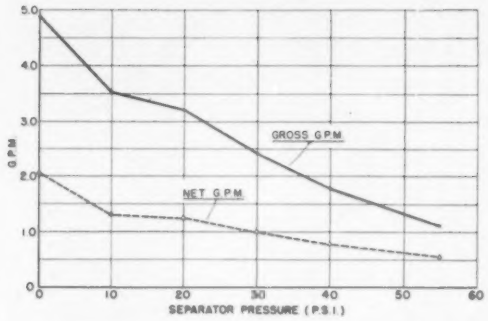
Plants • 417 Ninth Ave. S., Seattle 4, Wash.
2800 E. Imperial Highway, Lynwood (Los Angeles County), California
1035 Folsom St., San Francisco 3, Calif.
Belmont (San Francisco Peninsula), California
111 N. Palmer St., Houston, Texas
Representatives • 930 S. E. Oak St., Portland 14, Oregon
Room 712 Ross Bldg., Denver 2, Colorado
Engineering & Machinery Ltd., 1366 W. Broadway, Vancouver, B. C.

WESTERN GEAR WORKS
Manufacturers of **PACIFIC-WESTERN** Gear Products
Pacific Gear & Tool Works

Plants: Seattle
San Francisco
Belmont
(S. F. Peninsula)
Lynwood
(Los Angeles County)
Houston



LIQUID CONTENT of gas from formation "A," going from separator to plant (Fig. 1).



LIQUID CONTENT of gas from formation "B," going from separator to plant (Fig. 2).

How to cure some of the headaches in

Producing and Gathering Low-Pressure Gas

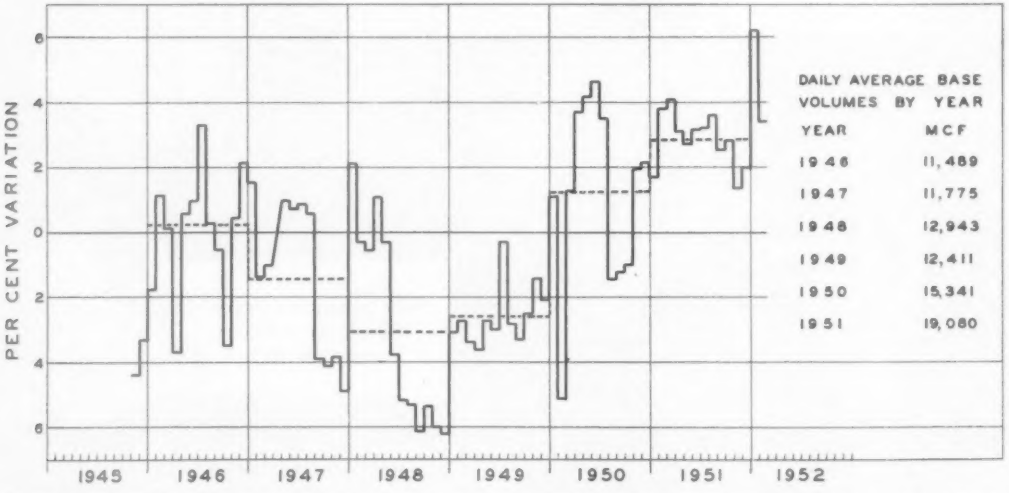
Problem No. 1 is that of communications. What is needed is a system that travels three ways: up, down, and sideways, the author believes

by Carl L. Ritter*

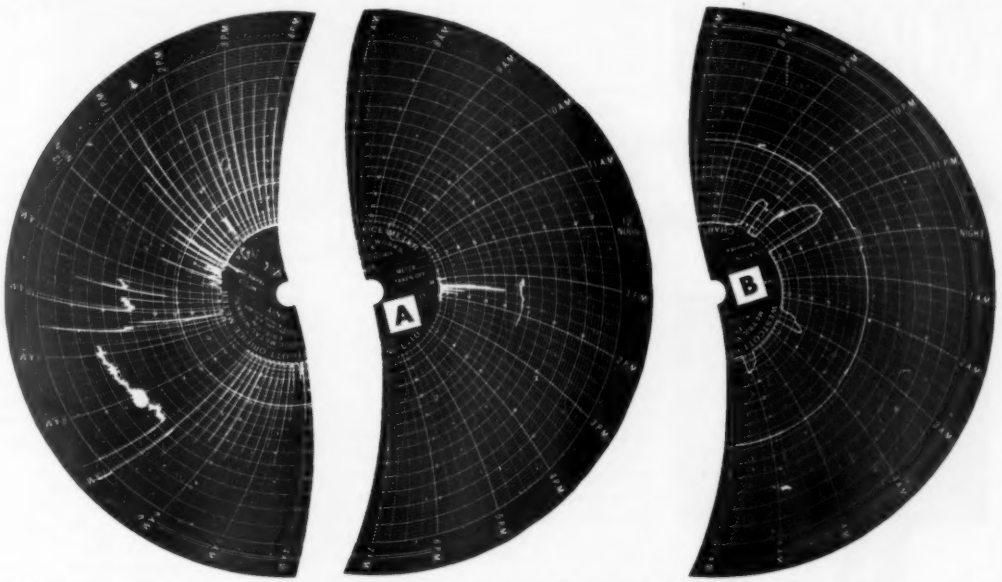
THE gas or oil producer is faced with many problems, and nearly every one of them has a direct bearing on the installation and operation of a gas-gathering system. Problems of oil and/or salt-water carryover from separators or heater treaters often cause disagreement between the oil or gas producer and plant personnel. This production problem is acute in areas of flush production, areas with high paraffin content in oils, and in areas in the final depletion stage where it is necessary to produce a large volume of salt water with a very few barrels of oil.

All too often separators, flow lines, and dump valves are sized to operate at lower flow rates and at higher pressures than are actually used. Use of manufacturers' ratings can be mislead-

*Assistant director, natural gasoline and gas operations, Continental Oil Co., Houston. Paper presented at annual meeting, Natural Gasoline Association of America, Houston.



METER COMPARISON . . . Measurement of gas by master meters as compared with field meters. Dotted lines show per cent variation by yearly period. (Fig. 3).



GAS CHARTS from well produced by gas lift equipment, operating on intermittent gas injection by time cycle. Chart A shows chart speed of one revolution per 24 hours; Chart B shows speed of one revolution per hour. (Fig. 4).

ing, since such ratings are based on steady flow. If consideration is given to peak rates of flow and expected minimum operating pressures in sizing equipment, the problem of separator carryover would be greatly minimized.

Not all the blame for separator carryover can be placed upon the producer because, in a great many cases, carryover is due to failure of the back-pressure regulator to seat properly. Since, in nearly every case, the back-pressure regulator is installed and maintained by the gasoline-plant personnel, the solution to this problem is up to them.

In cold climates, the design of batteries and gathering systems should be coordinated to provide shelter and heat for separator controls, wet-gas regulators, and relief valves. Batteries are now being designed and built using oil treaters (instead of boilers) with the result that no steam is available to combat freezing. It is possible that some type of portable steam generator could be obtained that would remove the temptation to use an open flame to thaw regulators and lines in hazardous locations. Injections of hot calcium chloride water is a method used in some locations, but this has obvious drawbacks. Constant surveillance of equipment and close cooperation between the producer and the plant personnel are necessary in preventing many of these troubles.

It is possible to reduce separator carryover by increasing separator pressure. However, the pressure carried on the separator can materially affect the liquid content (G.P.M.) of the gas going to the plant. Net and gross G.P.M.'s at various operating pressures is shown in Fig. 1. These data were obtained by compression tests of gas from two different formations in the same field.

The curve for Formation "A" (Fig. 1) shows that any increase in separator pressure from 0 to 30 psi. will materially affect the recovery of the gas. The separator pressure could be raised from 30 to 55 psi. with very little effect on recovery.

The curve for Formation "B" (Fig. 2), shows that any increase in separator pressure from zero pounds to 55 psi. will have a marked effect on the G.P.M. of the gas.

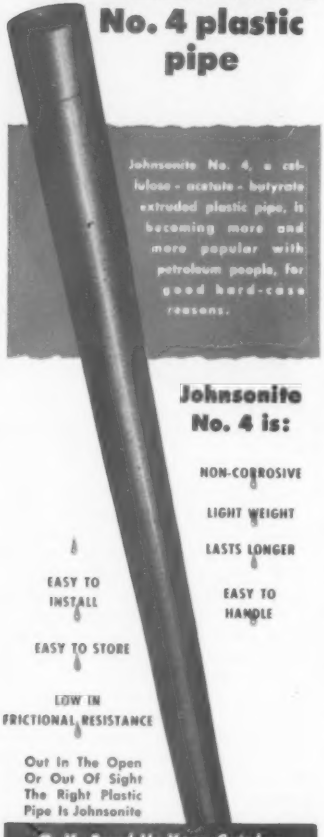
It is sometimes hard to convince a producer that he should use the minimum separator pressure necessary to dump the oil. Sometimes a decrease of 3 to 5 psi. on a separator will give an increase of ½ gal. of gasoline per M.c.f.; but, since any one producer may sell only a small portion of the plant's over-all volume, his monetary gain is small and may not offset possible operating troubles that the lower pressure might cause. On the other hand, when the same half gallon increase in G.P.M. is applied against the total plant volume of say 20,000 M.c.f. a day, it means an increase in production of 10,000 gal. daily. At a price of 5 cents per gallon, this amounts to $500 per day. Because of the increase in market price of gas and products, and, also, because the producer in many cases owns his pro rata share of any new plants being installed, he stands to gain not just from his lease but, also, from his ownership in the plant. For maximum benefits to both producer and plant owner, the separator pressure should be set to best meet the over-all requirements of lease and plant.

Horizontal vs. Vertical Meter Runs

In Continental Oil Co. operations more freezing trouble is encountered when using vertical meter runs than when horizontal runs are used. The vertical meter runs fill meter and gage lines with condensate and water more readily than the horizontal runs. Certain plant gas is metered through horizontal runs with very little trouble. The same gas is measured through vertical runs, and water in the gage lines results in considerable meter maintenance.

On some of these vertical meter runs, condensate traps, 30 in. in length fabricated from 2-in. pipe have been installed. This type of trap has been connected by running the pipe out of the flange taps down into the side of

Combat
CORROSION
with
Johnsonite
No. 4 plastic
pipe


Johnsonite No. 4, a cellulose - acetate - butyrate extruded plastic pipe, is becoming more and more popular with petroleum people, for good hard-case reasons.
Johnsonite No. 4 is:
NON-CORROSIVE
LIGHT WEIGHT
LASTS LONGER
EASY TO HANDLE
EASY TO INSTALL
EASY TO STORE
LOW IN FRICTIONAL RESISTANCE
Out In The Open Or Out Of Sight The Right Plastic Pipe Is Johnsonite

O. K. Send Us Your Catalog

Name_____

Company_____

Address_____

City_____ State_____

Producers of Quality Johnsonite No. 1, 2, 3 and 4 Plastic Pipe For Industrial and Commercial Applications Everywhere

JOHNSON
PLASTIC CORP.
BOX 268 • CHAGRIN FALLS, OHIO

the trap, then, from the top of the trap with a valve to the meter. No valve is installed between the flange tap and the condensate pot. This type installation has cut down on freezing troubles.

Where possible on horizontal runs equipped with orifice fittings, the orifice fitting is placed on its side so that the flange taps are in a vertical position. Then, by using ½-in. piping freezing troubles have been reduced considerably, as any condensation or free liquid that gets into the lines will tend to gravitate back into the meter run before it reaches the meter mercury chamber.

Mercury or condensate pots have paid their way in recovered mercury and reduced maintenance in Continental's operations.

Problems of metering gas where pulsation is present are of grave concern to all operators. At times orifice plates, or some other way of choking flow, have been used to reduce effects of pulsation. A large pressure drop between the meter run and compressors will help in a great many cases. Generally, every increase in pressure drop calls for additional horsepower.

Pulsation Snubbers

Installation of a snubber on each compressor has been recommended. Also its use on the main suction line or main discharge line from a group of compressors has been suggested.

Continental's experience does not include use of a snubber on each compressor. However, snubbers have been installed on the main discharge line from a group of compressors in two different areas and the results obtained have been very good. Plans call for installation of a snubber on the main suction line to a group of compressors in the near future.

To cut down on the effect of pulsation, in a few cases, the master meters and pressure control regulators are installed ahead of the first-stage suction scrubbers. Comparison of gas measurement by master meters with that of field meters in one of the plants where this type of installation is in use, is shown in Fig. 3. This chart uses field meter volumes as base measurement. From November 1945 until March 1950 there were 2 master meters and 18 lease meters in service. Since March 1950 there have been 3 master meters and 29 to 30 lease meters in service. The data shown in Fig. 3 illustrate the trouble experienced in trying to balance volumes by field meters with those of master meters. In some instances there is very little difference by months between the master meters and the lease meters, but at other times they show any where from 6.2 per cent less gas to 6.2 per cent more gas.

The dotted line on the chart (Fig. 3) shows the per cent variation by yearly periods. While this variation has changed from year to year, there was only one year when the difference has been slightly above 3 per cent. That was in 1948 when the master meter showed 3.055 per cent less gas than was shown by the total of the lease meters for the year. The variation for the yearly periods is still not too bad, but then again there appears to be room for improvement. Of interest is the fact that from November 1945 through February 1952 the total volume shown by the master meters is 0.038 per cent less gas than shown by the total of the lease meters. Total volume of gas measured during that period was approximately 32 billion cubic feet.

The variations shown in Fig. 3 have been unaccountable, so far. There appears to be a tendency for the measurements to cycle with seasons of the year or with settlement test periods, but on close observation no correlation is evident.

Gas Lift Problems

Probably one of the biggest headaches in metering is encountered with gas-lift gas. Fig. 4 shows a portion of a gas chart from a well that is being produced by gas-lift equipment which operates on a time cycle injecting gas intermittently. The flow rate as shown by this particular chart varies from zero to 2,415 M.c.f. per day. Note that the gas-lift valves stuck open and the differential pen arm moved off the chart at approximately 7 a.m. About 15 minutes later the differential pen arm moved back onto the chart, and for around 2 hours gas was injected into this well at the rate of 2,100 M.c.f. daily. After this had continued for about 2 hours, the trouble was finally located and remedial measures taken, but it was not completely lined out again until approximately 12:45 p.m.

The volume of gas from the lease under discussion averages, normally, approximately 250 M.c.f. per day. However, on this particular day, during the 2 hours that the gas-lift valves were stuck open, a total of 175 M.c.f. of gas was produced into the plant gathering system.

By working closely with the producer, losses due to gas-lift surges, have been cut down by changing the intermitters from 3 or 4 long injections to 20 or 30 short injections per day. In many cases the load on the gathering systems was relieved by alter-

30%

extra thruput GUARANTEED

UP TO 50% EXTRA THRUPUT *OBTAINED*
BY USING KOCH KASKADE FRACTIONATING TRAYS

LEONARD REFINING CO.
ALMA, MICHIGAN

Obtained increased thruput on 72" I. D., TCC synthetic crude tower to capacities of:

	Liquid	Vapor
Volume	115,300 #/hr.	82,480 #/hr.
Density	45.1 #/cf.	175 #/cf.
△p/tray	.....	1.38" H_2O

Koch Kaskade trays were installed on present supports — 36" centers.

PHILLIPS PETROLEUM CO.
WOODS CROSS, UTAH, REFINERY

Obtained increased thruput on 30" diameter, 110# psig. poly stabilizer to capacities of:

	Liquid	Vapor
Volume	36,700 #/hr.	20,000 #/hr.
Density #/CF	29.6	1.317

Koch Kaskade trays were installed on 24" centers.

WARREN PETROLEUM CO.
RINGWOOD, OKLA., GASOLINE PLANT

Obtained increased capacity on 72" 750# natural gas absorber to:

	Liquid	Vapor
Volume	460 gpm (lean)	75 mm. CF/D
Density #/CF	38° API (lean)	2.43 #/CF

Koch Kaskade trays were installed on 26" centers.

When extra thruput is your problem, it will pay you to investigate the economy and operating efficiency of Koch Kaskade Fractionating Trays. Write us today — no obligation.

KOCH ENGINEERING COMPANY, INC.
DESIGNERS — MANUFACTURERS & BUILDERS
321 WEST DOUGLAS — WICHITA 2, KANSAS
REPRESENTATIVES

nating the injections of gas between two or more wells.

If a complete study of each well is not made when time cycle equipment is used, gas will be injected when it is not needed, creating an unnecessary recycle of gas which not only increases the load on the gas-gathering system, compressor station, and plant, but is an added expense for the producer in compression costs in most cases.

Other types of gas-lift equipment work on the principle of pressure differential, injecting gas only when there is liquid in the well bore to be lifted. The charts shown in Fig. 5 are on the same well where this type of equipment is used. Chart A shows how the pen line looks when the chart is allowed to travel its regular speed of one revolution in 24 hours. The other chart shows how the pen line looks with the chart making a complete revolution in a 1-hour period.

The big surge of gas shown on the 1-hour chart occurred in a space of 2¾ minutes. Some of the other smaller peaks occurred in a space of approximately 1 minute and 15 seconds. On these particular charts, the gas rate varies from 0 to 1,240 M.c.f. per day.

It is very difficult to integrate the 24-hour chart, but it would be a simple matter on the 1-hour chart. These two charts were run on an integrator and the 1-hour chart showed 24½ per cent less gas than was calculated for the 1-hour period on the 24-hour chart. While the volume involved during the 1-hour period is very small, the percentage variation in measurement is far greater than we like to see.

With the close cooperation between the plant and field personnel, and daily checking of gas volumes, Continental operators are able to locate and shut in wells having defective gas-lift valves until remedial work can be done.

Operators of a plant furnishing gas for gas-lift purposes should strive to keep pressure on the gas supply system constant. If pressure is allowed to drop below that required for lifting a well, a loss in production results, and, if a well is off production for too long a period, it may be necessary to furnish gas at a considerable higher pressure to kick it off again.

Meter Runs

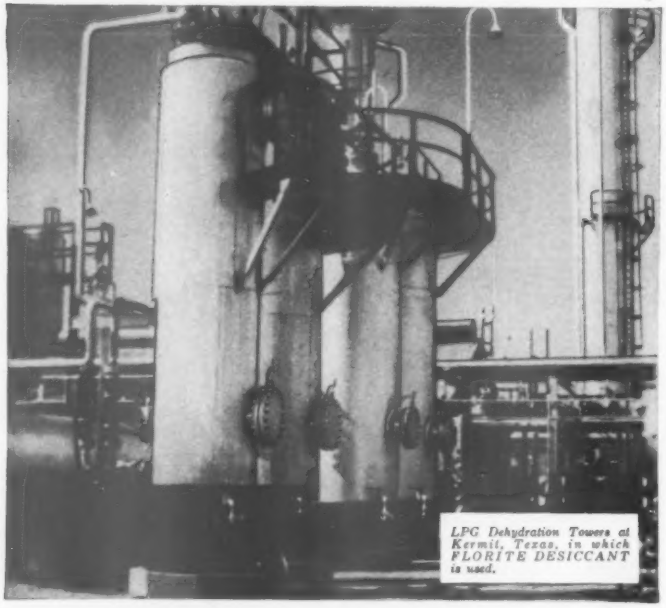
Meter runs should be sized with the thought in mind of metering the extremely high surges of gas flow. Where a 2 or 3-in. meter run would probably measure all the gas, if it entered the oil and gas separator at a steady rate of flow, it might be necessary to use a 4-in. or even a 6-in. run with surge flow such as from gas-lift operations.

Another method used in sizing meter runs, in order to have excess capacity, is to size them for flange connections and they should be fabricated with both flange and pipe taps. This has saved the expense of changing meter runs in several cases.

A few 50-in. meters have been used in gathering systems where gas-lift gas is encountered, but for readings at low rates as well as high rates of flow, better over-all results have been obtained by using at least a 100-in. meter. If a meter run is too small, a 200 or 400-in. meter might be the solution.

An integrating flow meter for measuring gas-lift should eliminate some of the human-element error in trying to interpret the graphic record on the gas chart.

Some tests to investigate the merit of using a displacement-type liquid meter in place of an orifice meter for measuring gas-lift gas have also been made by Continental engineers. Upon



LPG Dehydration Towers at Kermit, Texas, in which FLORITE DESICCANT is used.

FLORITE DESICCANT is the drying agent

The two propane dehydration towers seen in our illustration, which are a part of the Sid Richardson Company's noteworthy gasoline plant at Kermit, Texas, use FLORITE DESICCANT as the approved drying agent.

Natural gas, propane, butane, gasoline, air, nitrogen, carbon dioxide, refrigeration compounds, all are treated with superior drying efficiency by use of FLORITE DESICCANT. Selectively adsorbs 4 to 20% its weight of water—is regenerated by heating to 350° F. Full data on request.

FLORIDIN COMPANY — Adsorbents, Desiccants, Diluents

Dept. C, 220 Liberty Street, Warren, Pa.

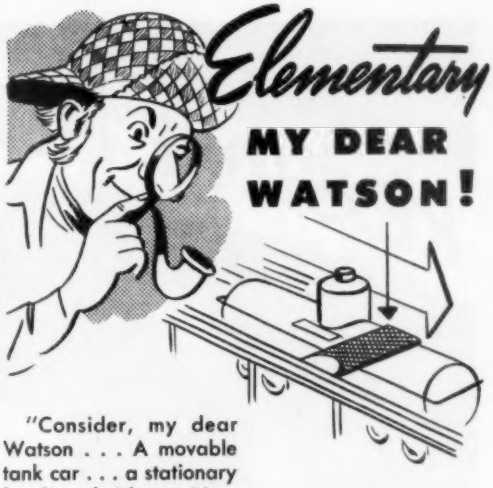
The Revolutionary NEW

GRIP-STRUT Safety GRATING

gives MAXIMUM STRENGTH with MINIMUM WEIGHT

NOT welded. Vertical members joined by integral saddles to form a positive NON-SKID surface under *all* conditions. In one single unit, GRIP-STRUT Safety Grating combines great strength with light weight, its side channel members greatly reduce cost of construction and simplify installation. Easy to maintain and clean. Replaces old or obsolete types of grating. Grip-Strut has a lower cost factor than any other type of grating. Available in steel or aluminum.

GRIP-STRUT division
THE GLOBE COMPANY
4016 S. Princeton Ave. Chicago 9, Illinois

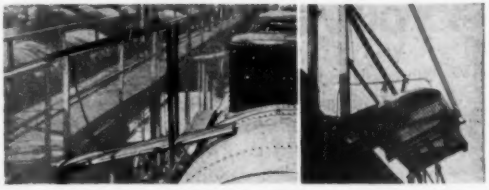


"Consider, my dear Watson . . . A movable tank car . . . a stationary loading bridge — Now suppose the car should move while the bridge is down! What would happen? ELEMENTARY, Watson — the bridge bends or breaks . . . damaging equipment . . . possibly injuring or killing service personnel. Bad, Watson, very bad!!"

BUT THE SOLUTION IS EASY TO FIGURE OUT TOO . . . IT'S THE

PAR-EX

PIERCE GATE-WAY BRIDGE



1. Swivel Gate-Way action eliminates side sill-wrecks caused by unauthorized switching or failure to withdraw bridge.
2. Variable length telescoping design . . . immediately adjustable. Non-telescoping available if desired.
3. Spring balanced . . . eliminates counter-weights.
4. All steel construction . . . non-skid walkway . . . folding hand-rails optional. Write for information.

PAR-EX
THE PAR-EX MACHINE CO.
PAR-EXCELLENT PRODUCTS & SERVICE
Manufacturers

7-15 WEST EASTON STREET, TULSA, OKLAHOMA

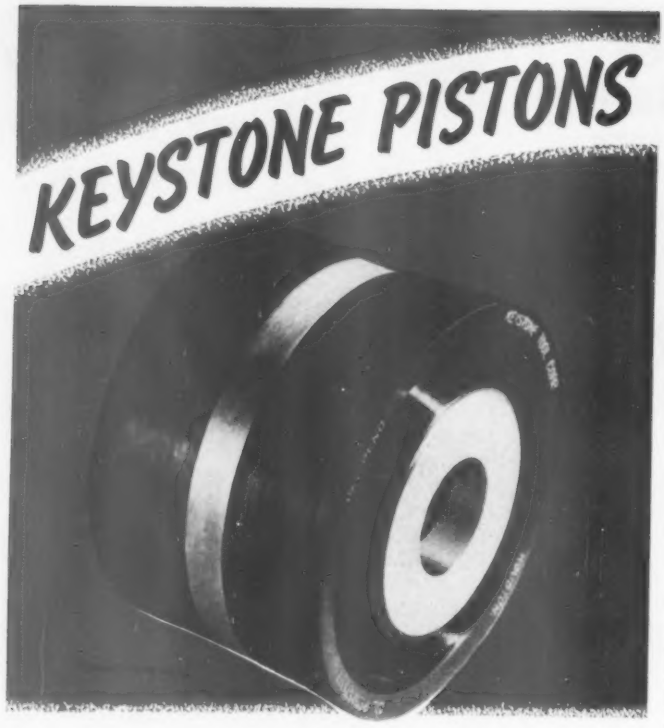
BUILT ON SERVICE
1st
SINCE 1866

NATIONAL BANK *in Houston*

Specialists in

OIL & GAS FINANCING

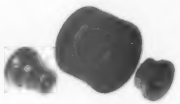
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION



COMBINE THE ADVANTAGES YOU'VE ALWAYS WANTED...

A simplified design with fewer parts . . . provision for fast, easy replacement of rubbers without removing the rod from the pump . . . a positive seal at low or high pressure . . . readily available and interchangeable parts plus longer service under all conditions. These are the advantages brought to you by KEYSTONE Pistons.

Sizes or types are available for all popular drilling rig, cement, acid, pipe line, boiler feed and refinery pumps. For complete information, contact your KEYSTONE representative or write for your copy of the complete KEYSTONE catalog.



KEYSTONE TYPE "H" Piston, with replaceable type, individual rubbers. KEYSTONE Type "S" Pistons are furnished with one-piece rubbers, both in natural rubber and oil-resistant.

C K STILLWAGON

testing a liquid meter in series with a 100-in. orifice meter, the liquid meter registered 25 per cent less gas. Proper gearing or a correction factor should remedy this difference. The initial cost as well as maintenance cost of such an installation might prohibit its use. The possibilities of this method is believed to merit further investigation.

Separator Batteries

Design and operation of low-pressure gas-gathering systems presents problems in sizing, metering, location of drips, protection from corrosion, protection from freezing, the securing and maintaining of rights-of-way, et cetera. The layout of the system will depend to a large extent upon type and location of separator installations made by the producer. The installation of one central separator battery for an entire field has definite economic advantages from the standpoint of the gas purchaser. Continental Oil Co. operates two plants that were first built with all of the lease separators for each field installed within the plant fence. Under this type of operation, it was necessary for the flow lines to be anywhere from a few hundred feet to over 3 miles in length. Operations at the start were very satisfactory, and it was possible closely to supervise operations and maintain equipment due to the compactness of this type unit. Very little difficulty, such as freezing of meters, controls, and the like, was experienced since an adequate supply of steam was available for heating regulators and other equipment during cold weather.

After a few years, at one of these plants, pressures of the various wells declined to a point where they would not flow into the central separator battery. After thorough study of problems, such as the handling of large volumes of salt water, and the need of keeping the well-head pressure as low as possible, it was decided to move all low-pressure well separators from the plant to the wells. A low-pressure gas-gathering system, adequate to handle both the gas produced by low-pressure flowing wells and the gas used for lifting wells that became too weak to produce under their own pressure, was installed. Seven tank batteries were installed in the field with the idea of keeping the oil flow lines as short as possible.

At the other Continental plant, because of the shortness of flow lines, it was decided to leave the central separator battery within the plant fence. This battery was revised into a group of low-pressure and a group of high-pressure separators. To take care of the increasing volume of salt water and to adequately treat the oil, a battery

WHO ELSE GIVES YOU THIS MUCH PROTECTION?

WINSLOW ENGINEERING COMPANY
WARRANTY
ONE YEAR REPLACEMENT CONTRACT
All products manufactured by Winslow Engineering Company are warranted to be free from any defects in workmanship and material. If, within one year from date of original purchase for installation, any unit or part of any of these products is found after inspection at the Winslow factory to be defective, it will be replaced free of charge if returned to the manufacturer, Winslow Engineering Company, Oakland, California, charges prepaid. No guarantee for element life in service is implied by this warranty.
Guaranty
Winslow products, when used as accessories, are further guaranteed not to harm in any way any equipment to which their use has been specified by Winslow engineers, providing the products are installed and used in accordance with specifications and instructions issued by Winslow Engineering Company.
Winslow Engineering Company neither assumes nor authorizes any other person to assume for it any further liability than expressly stated in this warranty.
Chas. A. Winslow
President
WINSLOW ENGINEERING COMPANY
Oakland 8, California

Winslow guarantees both the quality of its filters and elements and the safety of your equipment when these products are used on it. When you buy Winslow, you buy peace of mind. Enjoy this added value!

WINSLOW FILTERS

Winslow Engineering Company 4069 Hollis Street • Oakland 8, California

of heater treaters was installed adjacent to the separator battery. Facilities were also provided to boost the low-pressure gas to absorber pressure for processing.

The producers usually install a central separator to serve a group of wells, but at times a separator is installed at each well. The type of installation to be made depends upon the characteristics of the field and economics. From the standpoint of the gas gatherer, connecting one central separator for a group of wells is more economical than to connect individual well separators for the same total volume of gas.

Sizing of a gathering system, especially the main lines, is sometimes difficult because the field-development program is usually incomplete when the plant and gathering system are planned. A certain amount of future development can be anticipated and provided for in sizing the lines. However, it is not economically feasible to provide line capacity for some of the more optimistic expectations.

In sizing a gas-gathering system, it is very important to have the pipe lines large enough to handle the available gas volume without causing undue pressure increases at the ends of the gathering system. Experience has proved that sizing the gathering system for the expected average daily volume is not adequate. Some allowance in capacity must be made for peak gas loads. In the past main lines have been sized for 15 to 33⅓ per cent more gas than the expected average daily volume. This has been satisfactory in the majority of the cases, but not in all.

A large step towards solving the sizing problem has been found in closer cooperation between plant personnel, producer, and the engineering department. Continental's present method for sizing a gathering system calls for a thorough gas survey by the gas tester and plant personnel. This information is correlated with data from the petroleum-engineering and reservoir-engineering sections. From these data all the factors are correlated, the oil and gas reserves, and potentials are worked out and a forecast made as to the expected gas production for a period of years. From this type of study, a gas-gathering system that will come nearer meeting the requirements may be sized.

To keep a plant at constant load and at the same time to keep from flaring any gas, it is sometimes necessary to ask the producer to flow all wells as near as possible at the calendar-day allowable. However, it is not always easy for the producer to accommodate in this respect because some wells must be produced at higher rates in order to keep them flowing efficiently.

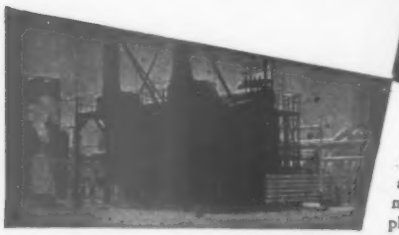
Whether to bury the gas-gathering system or install an aboveground system is a problem that has to be faced at the time each project is installed. Some advantages of buried lines are generally less freezing, less stress on the lateral connections, less necessary slack, improved aboveground appearances and, in many instances, better relations with the land owners. Some of the disadvantages are external corrosion, difficulty in finding leaks, more expensive repair and replacement, deeper valve boxes and drip connections and, generally, more expensive installation.

When underground gathering systems are installed, corrosion possibilities should be thoroughly investigated. To provide maximum protection for a long period of time, the best recommended installation is to both coat and wrap and install cathodic protection.

Where gas-gathering lines are to be buried, climatic conditions must be considered in deciding on the depth to bury them. In one area where Continental operates the pipe lines must be

WICKES

STEAM GENERATORS SPEED PROCESSING AND CUT COSTS IN REFINERIES AND NATURAL GASOLINE PLANTS



Central Texas Natural Gasoline Plant

Louisiana Refinery

Indiana Installation

The Wickes Type A Steam Generator is proving itself one of the most serviceable boiler units employed by the oil and gas industry. Wickes can fill your exact requirements for boilers of any type up to 250,000 lbs. steam per hour and 850 p.s.i. Wickes service facilities are world-wide and our knowledge of steam generation is available to you without obligation. Write for descriptive literature on the famous Wickes line of steam generators.

WICKES

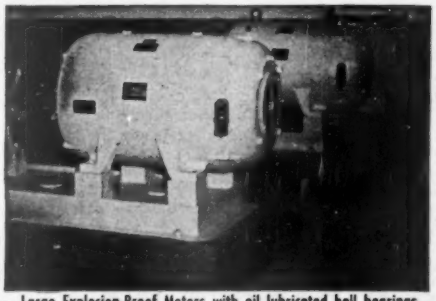
THE WICKES BOILER CO. Saginaw, Mich.
Division of THE WICKES CORPORATION
RECOGNIZED QUALITY SINCE 1854

SALES OFFICES: Atlanta • Boston • Chicago • Cincinnati • Denver • Detroit • Houston • Indianapolis • Los Angeles • Milwaukee • New York City • Pittsburgh • Saginaw • San Francisco • San Jose • Springfield • Seattle • St. Louis • Tulsa • Mexico City • Buenos Aires • Manila • Havana • Montevideo • San Juan, P.R. • Victoria, B.C.

134

The American-National *Horizontal* Oil & Gas Separator handles a greater volume of gas because of its new super-efficient gas-scrubber unit—and does it more effectively because of larger interface area between gas and liquid. Capacities up to 86 million cu. ft. of gas! Proved on low ratio foamy oil and condensate! Hundreds in operation. Compact, portable! Our service engineers will gladly give you the complete time and money-saving details. Write or telephone today American Pipe & Steel Corporation, 2201 W. Commonwealth Ave., Alhambra, California CUmberland 3-2181. ATlantic 2-3115. *Bakersfield:* U. S. Highway 99 and Casa Loma Dr., phone: 4-9877.

Continental
EXPLOSION-PROOF MOTORS
1 to 700 h.p.



Large Explosion-Proof Motors with oil lubricated ball bearings.

CONTINENTAL ELECTRIC CO., INC.
325 Ferry Street, Newark 5, N. J.
Plants—Newark, N. J. and Rockford, Ill.

Producers

Refiners

Marketers

Most complete line of
HIGHEST QUALITY
PETROLEUM PRODUCTS

CITIES SERVICE

William M. Barret, Inc.

in observing its 25th Anniversary of service to the petroleum and mining industries, is pleased to announce the wider availability of

RADOIL

for exploration and field definition

Another in a series designed to explain the function and application of the RADOIL method.

RADOIL*

HOW DOES RADOIL OPERATE?

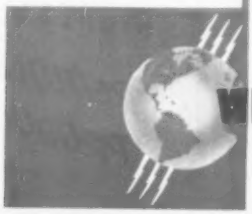
RADOIL is an electromagnetic technique for the *direct* location of oil. It is based on the use of electromagnetic energy in the form of radio waves. There are five distinct steps in the RADOIL operating principle:

1. Radio-frequency energy in the form of a "surface wave" is directed along the air-earth boundary toward a receiver positioned at varying distances from the transmitter.
2. As the surface wave moves toward the receiver, a progression of electromagnetic "rays" is refracted downward into the earth along substantially parallel paths.
3. Upon striking a reflecting stratum, some of the rays are refracted farther into the earth, while others are reflected upward to the surface where they are again refracted and rejoin the surface wave.
4. The combined energy of the wave sweeping the surface and that of the reflected rays returning from depth is indicated by the receiver.
5. Due to the unique electrical contrast that exists at the boundary of an oil field, where the oil frequently lies in contact with salt water, evaluation by RADOIL specialists of the combined energy arriving at the receiver will indicate the presence or absence of an oil boundary.

RADOIL is the only known method by which radio waves may be forced past the air-earth barrier to varying depths in the earth, reflected back through the same severe barrier at the surface, mixed for comparison with a surface wave, and then received in sufficient volume to be recorded and analyzed with accuracy.

The above description of the RADOIL operation is necessarily brief, with much pertinent information omitted. A more detailed explanation of the method may be had on request, as can information pertaining to contracting and licensing of RADOIL. Information is also available on RADORE, an adaptation of the RADOIL method for use in locating ore deposits.

INQUIRIES INVITED



GIDDENS-LANE BUILDING

M. M. BARRET, INC.

Shreveport, Louisiana

*Trade-Mark and Service Mark Registered U. S. Patent Office.

buried with a minimum cover of 4 ft. or they will be better off by leaving them on top of the ground.

Several of Continental's gas-gathering systems are installed aboveground. Some of these systems have given very little trouble; others have given considerable trouble. Experience on the installation of aboveground gathering systems indicates that the lines should be installed on an even grade. It may even be necessary to install A-frames in some of the low places so that the aboveground lines may drain to a few well-placed drips. Ninety-five per cent of Continental's freezing troubles have been encountered on the poorly graded lines.

Considerable trouble has been experienced with leaks where wrinkled bends on thin-walled pipe have been used. Line breaks where lightweight lateral lines have been saddled into thin wall trunk lines have also been experienced. One suggestion that has been made to help eliminate this trouble, is to install a short piece of standard-weight pipe where lateral line connections are to be made.

Whether an aboveground or a buried gas-gathering system is installed, it is highly recommended that drips be installed to adequately protect the system from condensation and separator carry-over. Drips should be made from heavy pipe rather than thin-wall pipe to allow for corrosion.

Lack of properly placed block valves in gathering systems has caused considerable operational difficulties during line breaks. Valves are expensive and careful study should precede their installation. Unless the gas to be flared during a repair job is a very small quantity, the minimum installation should include a valve on each lateral at the main trunk line. In a great many cases, it may be economic to install a valve on the main line just upstream from the laterals.

One recent problem involved flaring of from 2 to 2½ million feet of low-pressure gas daily because of insufficient compressor capacity and erratic flow of low-pressure wells. The greatest part of the erratic flow is due to gas-lift operations. In this particular case, the separators are very close to the plant and the low-pressure gas gathering system has very little surge capacity.

Careful study of flare meter charts indicated that when the gas heads reached the plant the excess gas would flare for approximately 6 minutes. The charts also indicated that additional compressors alone would not necessarily prevent flaring unless compressor capacity was installed for extreme peak conditions. If compressors were installed to handle peak volume they might be underloaded as much of the time as they would be overloaded. It was decided to install a portable compressor with a capacity of approximately 3 million feet of gas per day and to install a volume chamber between the pressure-control regulator on the separators and the suction pressure-control regulator to the compressors, as a solution to the problem. Pressure on the volume chamber will vary between 45 and 100 psi. Calculations indicate that this volume chamber would practically eliminate the gas flare.

There are other gas gathering system problems such as safety and securing and maintaining rights-of-way that should be considered. However, the most difficult and yet the most important problem of all requiring solution is that of communications. Production personnel and plant personnel should be acquainted with one another's operating problems, and should recognize the fact that these problems can be solved or minimized to the advantage of both.

In addition . . .
VICTORALLOY cuts rod cost and reduces welding time 25 to 50%.

HERE'S HOW:

VICTORALLOY is an all-position rod . . . vertical surfaces, end bits, blades, etc., can be hardfaced in position.

High burn-off rate, 6 lbs. per hour, speeds application.

One pass with VICTORALLOY'S high, rounded bead deposits as much metal as most rods do in two passes.

No slag interference—you eliminate chipping and cleaning.

Try VICTORALLOY NOW. Order a supply from your VICTOR dealer TODAY.

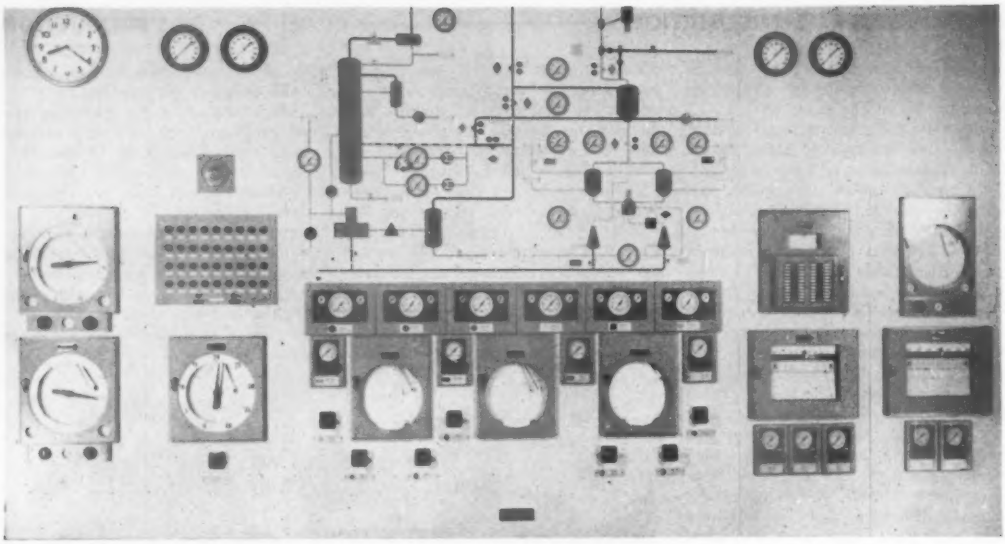
VICTORALLOY is designed especially for track rollers, idlers, grousers, end bits, cutting edges, tamper feet and other parts subjected to continual abrasion and severe impact. Its high chromium content produces a hard, polished finish that reduces friction . . . and doubles working life.

Write for literature on complete line of hardfacing alloys by VICTOR. Dealer inquiries invited.

VICTOR
Welding and Cutting Equipment
Since 1910

VICTOR EQUIPMENT COMPANY

3821 Santa Fe Ave. LOS ANGELES 58 | 844 Folsom Street SAN FRANCISCO 7 | 1312 W. Lake St. CHICAGO 7



SEMIGRAPHIC-TYPE panel with small dial-type gages mounted on the flow diagram. Instruments are identified at points of application by means of colored symbols. All plant symbols, correlation symbols, and flow lines are raised from the panel surfaces, with the flow lines color coded (Fig. 1).

New Light on Use of Graphic Panels

Increased processing activity enhances the advantages of graphic panels and miniature instruments. Here are discussed some of these advantages

by J. Weingartner*

ONE of the more clearly defined processing trends is in the direction of improved centralization of control through increasing use of graphic panels. This logical evolution in the science of industrial process control has been brought about largely by the increasing complexity of processing methods and equipment. The profound effect on design of instruments is reflected in the present highly accelerated development of instrument components for use with graphic panels.

Finally, panel engineering — the science of designing a control panel so that it contributes materially to the efficiency and ease of operation of an industrial process — has progressed to the stage where it occupies a vital place in the field of instrument engineering.

Without the graphic panel, the number of instruments employed on many processes reach the point where control panels become unwieldly, demanding increasingly more attention and space. Operator training time increases. Confusion in instrument identification sometimes results in the use of small flow diagrams pasted on instrument doors in order to identify the point of application of each instrument in the process.

Perhaps the most serious problem is that of lags attendant to long transmission distances. For example, a relatively long period of time is required for a sensing element to detect a process upset, transmit the signal to a controller mounted on the board, and for corrective action to be transmitted to the final control element.

Realizing these problems, two major types of panels have been developed. These are the semigraphic and full graphic—each of which embodies specifications necessary in processing applications.

Semigraphic . . . In the semigraphic panel, newly developed small-size instruments, as well as conventional-size recorders and controllers, are mounted below a flow diagram of the process under control (Fig. 1). Where space below the diagram proves inadequate, wing panels are added to accommodate the conventional size instruments. The use of color is important in identifying plant streams, as well as in identifying points of application of the various instruments employed. Small, dial-type indicators are the only instruments employed in the flow diagram.

In the full-graphic type, two variations are used. In the first of these, remote control-point setting and indicating instruments are mounted in the flow diagram. Wing panels are employed for mounting conventional-size recorders and controllers.

In the second variation of the full-graphic type, miniature recorders and/or indicators are mounted directly in the flow diagram, with nonindicating controllers mounted either back-of-board or on the process. Wing panels and their conventional instruments are eliminated.

Development of Instrument Components

It is readily apparent that graphic-panel advancement lingers upon a parallel development in instrumentation de-

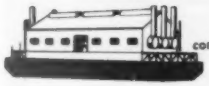
*Manager, panel division, Brown Instruments Division, Minneapolis-Honeywell Regulator Co.

Levingston

BUILDS FINE SPECIALIZED MARINE EQUIPMENT FOR THE PETROLEUM INDUSTRY

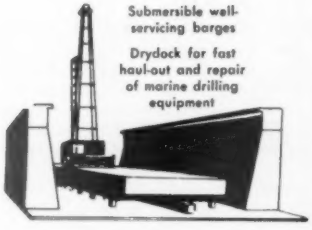
Submersible drill barges

Tugs



Boiler and compressor barges

Water, oil, and supply barges



Submersible well-servicing barges

Drydock for fast haul-out and repair of marine drilling equipment

Levingston is not only located conveniently with respect to marine drilling operations on the Gulf Coast, but here you will find marine engineers and constructors who understand the language of oil operators. Bring your marine petroleum equipment problems to Levingston *first* for a quick economical solution.

Levingston

SHIPBUILDING CO.

Orange, Texas

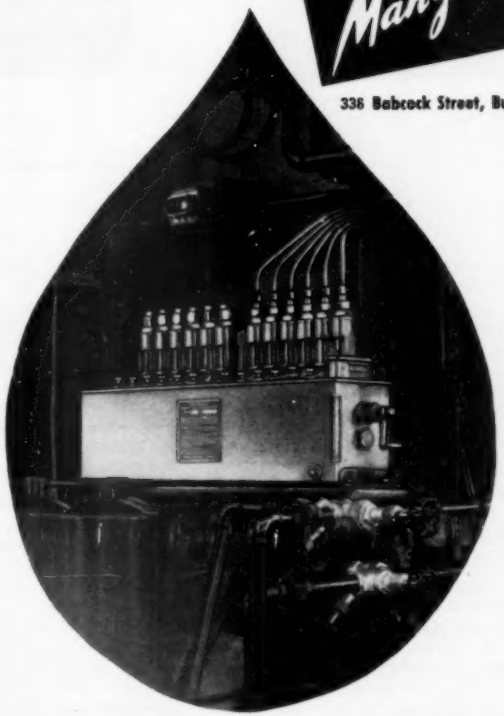
Oil Industry Equipment Needs *OILING*

..Oil Industry Equipment Needs *MANZEL*

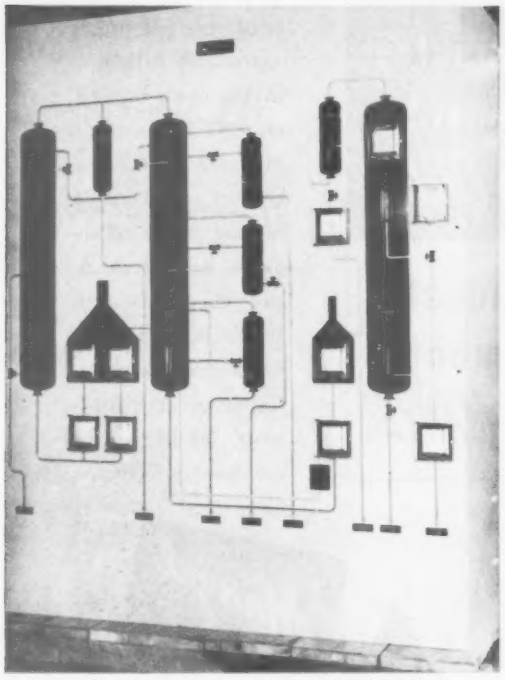
Even machinery that produces oil needs automatic oiling to insure long-lasting, trouble-free service. Manzel Force Lubrication is standard on leading makes of engines, compressors, and other machinery. It can be engineered to *your* requirements. Experienced representatives throughout the country. Write...

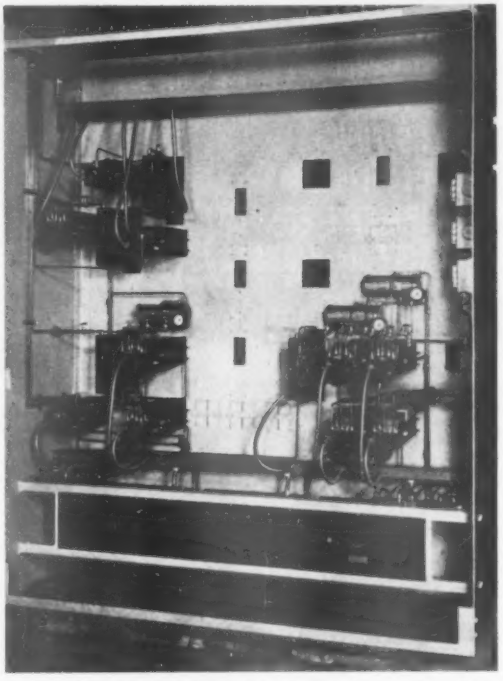
Manzel

336 Babcock Street, Buffalo 10, N. Y.



Manzel Lubricates Worthington Diesel. ***What's Your Problem?***





FULL-GRAPHIC-TYPE panel, (left) designed for a petroleum refinery, with Tel-O-Set recarders installed directly in the flow diagram. Cover plates are provided for mounting of additional instruments, if needed (Fig. 2). REAR VIEW of full-graphic-type panel, (right). Panel cutouts are clearly visible. The black cutouts are covered on front of board by symbols of processing vessels, and are provided for future insertion of liquid level indicators and Tel-O-Set recorders. Note the Tel-O-Set controllers (near small dial gages), and three electronic temperature transmitters mounted on a relay rack along the bottom (Fig. 3).

signed specifically for use with these control boards. Again, the major consideration are reduction of board size, as well as a diminishing of transfer lag. Fortunately, both objectives lie in the same direction.

Transfer lags can be minimized by shortening transmission distances for pneumatic transmitters. This suggests separating controlling from measuring means, and mounting the latter on the process and the former on a centrally located control board. Separation of these units affords an opportunity to reduce the size of each. These smaller devices gain in compactness without any loss in sensitivity, accuracy, readability, and similar qualities.

Panel recorder . . . Functionally, the panel recorder (shown in Figs. 2 and 3), provides a continuous record of the process variable. By means of knobs and switches, easily accessible inside the door, the control-valve air-pressure loading, and the set point can be obtained, or an operator can switch from automatic to manual operation and back to automatic without upsetting the process.

The design of the panel recorder incorporate many plus features requested by prospective users, covering (1) size and readability of chart and (2) ease of adjustment and maintenace.

Ease of adjustability and maintenance . . . In an actual installation, it is apparent that back-of-board adjustments and maintenance would be inconvenient because of the maze of pipes and tubing. In many cases when maintenance is required, an instrument man would be compelled to remove possibly two adjacent instruments in order to get to the one in need of repair, unless provisions were made in the design of the recorder so that all adjustments and maintenance operations could be performed from front of board, as in the case with the panel recorder.

While in operation, the chassis can be partly withdrawn, and locked in position by means of a safety catch. In this position, zero adjustments, coarse and fine span adjustments, and restriction adjustment screws are accessible, and the unit is in position for chart replacement and pen-and-ink servicing.

In the event that maintenance is required, the instrument man releases the safety catch, disconnects two air lines (finger-tight screw connections) and the electrical leads to the motor. The chassis can then be withdrawn completely from the case. Since these units are interchangeable (with the possible exception of chart and scale) the operator can connect another chassis in its place and take the replaced one to the instrument shop for repair.

Panel indicator . . . Functionally, the panel indicator is identical to the recorder, except that it provides an indication only of the process variable. Like the recorder, it is designed to operate in conjunction with a pneumatic transmitter, a pneumatic controller, and a diaphragm motor control valve.

Panel controller . . . The third member of the panel family is the controller. This is a low-cost, easily installed, compact unit which provides practically trouble-free operation. This unit offers many distinct advantages to users, such as high sensitivity, instant response to process changes, a pneumatic-balance principle of operation which eliminates

When the going is *ROUGH*

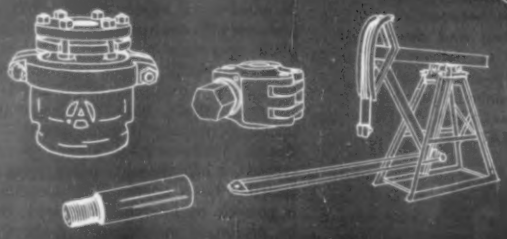
use ALTEN PUMPING UNITS!

The value of a pumping unit depends solely on performance — because Alten units are thoroughly pre-tested, you can be sure all will perform to their full rated capacity. Alten constant quality control gives you a sure-fire way to eliminate all guesswork, get top pumping performance, and cut operating costs.

YOU GET

Thorough Factory Pre-Testing
Longer Strokes
Higher Gear Reducer Ratings
Flame Hardened Helical Gears

Buy Alten Oil Field Pumping Equipment at Your Local Supply Store.



Advantages of Helical Gears

- Hobbing process gives more accuracy than shapers used to produce herringbone gears.
- No unflexing V centers which cause uneven wear.
- 10% to 20% lower impact or backlash loads.
- Flame hardened gear teeth for hardest surfaces.

ALTEN
Foundry & Machine Works, Inc.
LANCASTER, OHIO

friction and lost motion, and many other features designed to provide a reliable accurate controller. Economy of selection is provided by a fixed proportional band model, and an adjustable proportional band model, both providing proportional-plus-reset control. In those relatively few applications where rate action is required on the process, the function can be supplied in a separate unit.

From a control point of view, probably the greatest advantage of the panel controller is that it, with the other members of the family, permits the utilization of close-coupled systems, thereby resulting in a minimum of transfer lags. The merits of close-coupled systems have been established for processes where measurement and control lags are small. Thus, in a flow installation, for example, a panel controller can be mounted adjacent to the point of measurement and the final control element. This results in quick corrective action for small measurement variations because of the minimizing of transfer lags. Where transfer lag is a small part of the total characteristic time of the system, such as in temperature control, the panel controller can be mounted on back of board.

Panel-board engineering . . . It is not surprising that on the subject of graphic panels, there is considerable disagreement regarding design and layout. Recognizing this, each panel board should be custom designed to fit specifications.

What are some of the factors which must be taken into consideration? First, and most important, the panel must offer the utmost in operator convenience. Instruments must be placed so that they can be read quickly and accurately. Push-buttons, manual loading stations, signal lights, and other control accessories must be grouped logically with respect to pertinent indicators and recorders so that the operator, when necessary, can move quickly and surely, with no lost motion and no possibility of confusion, to make any required control adjustments. Secondly, the finished panel must be attractive, an important factor in minimizing operator fatigue.

How is this accomplished? Panel engineers, making use of data accumulated from field engineers prepare a suggested layout. This layout is studied, analyzed, and, when necessary, changed. A proposed final layout is arrived at and a front-of-panel drawing is sent to the customer. In some instances, especially where a graphic panel is involved, color is a critical factor.

Advantages of graphic panels . . . Although differences of opinion exist regarding the most efficient design and layout of graphic panels, processors and instrument engineers agree that there are many advantages to be derived from use of these boards.

It is generally agreed, for example, that graphic panels effect a reduction in panel-board spaces and in the size and cost of a control room. In addition, plant operating personnel, with little prior knowledge of the process being controlled, are appreciably aided in following flows, with the result that operator training time is greatly reduced. Instrument downtime is decreased, a benefit made possible by the fact that faster overhaul of instruments is possible by interchanging units, than by prolonged maintenance in the field of conventional type instruments.

Other advantages which have been claimed for graphic panels are that they are easy to install, and that they simplify startup procedure. These economies should become more apparent with improved instrument designs and as a better understanding of the panel is attained through its increased utility.

Equipment Can Be Built To Specification

But *you can't "Standardize" Service*

Plant superintendent . . . design engineer . . . construction engineer — all know heat transfer equipment . . . know that they'll get reliable, well-built heat exchangers from supplier "A", "B" and "C", but they turn to Western for SERVICE — the one thing that can't be "Standardized". And what IS service? It's Western's close cooperation between your engineers and its own experienced sizing, rating and design staff. It's Western's consistent all-out attempt to deliver the equipment when you need it. It's Western's never-ending battle to supply quality heat transfer equipment at the minimum possible cost. So on all your heat exchange needs — CHECK WITH WESTERN — a service that defies "STANDARDIZATION".

WESTERN
HEAT EXCHANGERS
TEMA
Manufactured by
WESTERN SUPPLY COMPANY
P.O. BOX 1888 TULSA, OKLAHOMA

YOU CAN COMPLETELY OVERHAUL

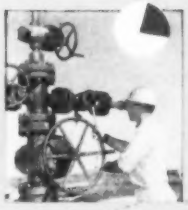
A W-K-M VALVE

RIGHT ON THE TREE

IN ONE HOUR!

1&2 Bleeding pressure out of valve (top) and out of packing gland (above)

3 Removing bonnet clamp ring.



4 Removing bonnet seal ring.

5 Removing bonnet, gate and segment.

6 Breaking seats loose.

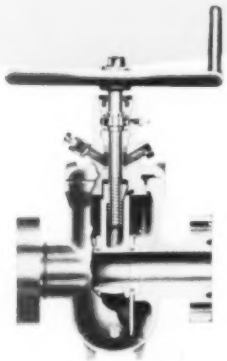
7 Removing worn seats.

8 Installing new seats.

9 Installing new gate and segment.

10 Replacing stem, bonnet and bonnet seal ring.

11 Replacing clamp ring and the job is done. Elapsed time, one hour.



● The above photographs illustrate how simple it is to overhaul a W-K-M Valve on the tree. When overhauled as shown, the valve becomes as good as new, ready for many more years of efficient trouble-free service.

There is no need to go into great detail to point out the advantages and economies of on-the-spot repair —it is self evident that even the least valve on a tree can raise hob with production if it cannot be repaired or replaced in the shortest possible time.

Long run performance is far more important than first cost. When you buy, specify W-K-M—and you will be sure of satisfactory operation for the life of your tree.

W-K-M *Valves*

W-K-M COMPANY • P. O. BOX 2117 • HOUSTON 1, TEXAS

727 W. Seventh Street, Los Angeles, Calif. • Export Office, 30 Rockefeller Plaza, New York, N. Y.

Specify

LARKIN

...Through Your Supply Store

Proved products that will do everything within the scope of floating, guiding and centering equipment to promote the successful cementing of casing.

LARKIN PACKER CO., INC.
St. Louis, Mo.

CENTRALIZERS

CEMENTROL COLLAR

CEMENTROL FLOAT SHOE

REGULAR FLOAT SHOE

FLOAT COLLAR, M&F

GEYSER FLOAT SHOE

FLAPPER TYPE FLOAT COLLAR

GEYSER GUIDE SHOE

BAFFLE COLLAR

REGULAR GUIDE SHOE

TRANSET FLOAT SHOE

New Light on Drilling and Completion Methods

(Continued from page 264)

until 6 to 10 ft. is standing on bottom.

2. The liner-packer assembly is set on bottom and the packer expanded by the weight of the stem on a mandrel which will not permit the tools to enter the guide shoe.

3. A redwood plug is run in on the bailer dart and seated in the packer.

4. On top of the plug is placed about 10 ft. of plastic which passes through the perforation in the casing and effects the sealing of the top of the liner.

5. After sufficient time has been allowed for the setting of the plastic, the plastic, plug, and stops are drilled out and the hole bailed.

The packer keeps the water-producing formation pressure from the sealing medium and since there is a 3 per cent expansion of the plastic upon setting, there should be no undue difficulty in sealing the formation.

Since the formations above the liner-packer probably will take water while the hole is full, after setting the liner it is necessary to continue bailing until drainage of the upper formations is complete. This will often require 1 or 2 days, but it is not necessary except where the next formation to be encountered is the pay sand; otherwise the hole can be bailed to the bottom and drilling continued using the draining water as the drilling fluid.

In order to minimize the entry of water into the porous zones above the liner, the hole can be treated with a commercial cable-tool drilling fluid. Not only will the fluid seal the porous zones to some extent, but the compound, reportedly sodium silicate, forms a rather tough sheath on the hole face which tends to reduce cavings. Further, one fluid sets as a plastic upon contact with salt water which would certainly reduce cavings, reduce fishing jobs, and enable more complete casing recovery in addition to sealing the porous zones and minimizing the water they take. It may well be that a more detailed analysis of the above effects will warrant an extensive use of a commercial drilling fluid.

Little effect has been made to introduce use of the liner-packer assembly since Lockett did not obtain patent rights on the process until December 1951, but the assembly has reportedly been employed in the field on two different occasions. However, price eliminates it from being considered as a straight substitute for any of the casing strings. Although the cost of the liner-packer assembly varies to some extent with the amount and size of the liner required, it may be estimated as $900 which does not compare favorably with depreciation of any of the casing strings.

Casing programs . . . The present casing program employs a 10-in. drive pipe to control surface water and strings of 8⅝ and 6⅝-in. casing to protect the Big Injun sand and the Berea grit. The "first water," relatively small in magnitude, is carried as in the "second water" which often has a head of 2,000 ft. and is encountered about 300 ft. above the base of the Big lime. A 5½-in. string of casing, which serves as the producing string, is set at the base of the Big lime, and after drilling in and cleaning out, a 4½-in. liner is set through the Clinton sand and the 100 ft. or so of shale which tops it.

It can be seen that aside from serving as the producing string, a major

AT YOUR SERVICE

Ken Service Men

READY TO HELP YOU during drilling operations, Ken Service Men offer close cooperation from the time of delivery of KEN-OIL oil base Drilling Fluid and KEN-PAK Casing Protector throughout the use of these fine products. KEN personnel is composed of well trained, thoroughly experienced petroleum engineers such as those pictured here: Wm. J. Rodgers in Oklahoma City, Okla.; Walter S. Forbes in Casper, Wyoming; Wallace McDivitt in Ventura, Calif.; Jay W. Waldren in Bakersfield, Calif.; and Forrest Holdeman in Long Beach, Calif.

For complete information about Ken-Oil and Ken-Pak write today for illustrated catalog.

KEN CORPORATION
OIL WELL DRILLING FLUIDS
2425 Gundry Avenue, Long Beach 6, Calif.
205 Irwin Keasler Bldg., Dallas, Texas

Distributors: Mud Control Laboratories, Inc., 150 E. Midwest St., Casper, Wyoming
1832 W. Reno St., Oklahoma City, Okla.; 111 N. Big Spring St., Midland, Texas
Petroleum Industries Consultants C.A., Apartado 1953, Caracas, Venezuela.

purpose of the 5½-in. casing is to protect the shale section underlying the Big lime from the water entering the hole and thus curtail its excessive casing. Further, that is apparently the only reason for setting the casing before reaching the Clinton sand. If the first water does not produce water in excess of the amount required for drilling, as is generally the case in Perry County, the liner-packer assembly can certainly control the second water at a nominal cost and thereby make it possible to set the producing string on top of the Clinton sand.

Although it would appear that such a casing program will be more expensive than the present casing program, this additional cost can be largely offset by the decreased drilling time resulting from drilling from the base of the second water to the base of the Big lime in a dry hole, rather than waiting until the base of the lime has been reached to control the water as with the present casing program. At the present time it is wise to delay casing until the base of the Big lime is reached in order to minimize the open hole exposed upon completion, but that will not be necessary if casing to the top of the Clinton sand is provided for.

The second water is generally encountered about 300 ft. above the base of the Big lime and fills the hole with approximately 2,000 ft. of water. Under these conditions drilling progress is reduced by approximately two-thirds as a result of the buoying effect of the water on the drilling string. The day-rate cost to an operator is generally about $60 per 8-hour shift and during a normal shift a driller makes approximately 30 ft. of hole, but with 2,000 ft. of water present, progress is reduced to about 10 ft. per shift. Consequently, in drilling the 200 ft. required to reach the Big lime after the proposed setting of the liner packer, 20 shifts or approximately $1,200 are required in a "hole full of water" while if the hole were dry it would be completed in seven shifts for approximately $420. This constitutes an estimated savings of $780 which alone will practically justify the difference in the cost of the casing programs without attempting to evaluate the much larger saving entailed in subsequent cleanouts and workovers of the well.

An alternative for casing to the top of the Clinton when the first water produces excessively, is to set a 6⅝-in. casing string through the second water with correspondingly larger shallow strings which will facilitate the cementing of a 5½-in. liner in the interval from the base of the second water to the top of the Clinton sand. This is a variation of a program recommended by Halliburton Oil Well Cementing Co. and would possibly result in a completion superior to the previously recommended program.

Casing justification . . . Up to this time the proposed change in casing program has been justified only from the standpoint of remedying a bad cleanout situation and saving some drilling time. However, other considerations may overshadow this justification. Water-flood operations have recently recovered as much secondary oil from many fields as was recovered during the primary life of the field. There is reason then to believe that primary production presently represents only half of the possible production of most reservoirs.

By completing wells in the manner now prevailing in Perry County, the possibilities of using the well in a flood are practically nil since considerable

QUACHROM
GLUCOSATE*
corrects
SEVERE
CORROSION
In the Petroleum Industry where severe corrosion is encountered, Haering's Quachrom Glucosate is constantly used for preventing downtime and increasing life of Heat Exchange equipment.
Write for our book, "Organic Methods of Scale and Corrosion", which tells graphically how Haering Glucosates have corrected scale and corrosion in many plants.
WE READ WATER
H-O-H
ESTABLISHED 1931
*Reg. U. S. Pat. Off.
D. W. HAERING & CO., INC.
GENERAL OFFICES
P. O. BOX 6037 SAN ANTONIO, TEXAS
CHICAGO OFFICE: 205 West Wacker Drive

HENRY H. PARIS DISTRIBUTOR Inc.

Manufacturer's Agent - Oil Well and Refinery Supplies

P. O. BOX 932 — 1125 ROTHWELL ST.

HOUSTON, TEXAS

Agent and Distributor for the following Nationally Known Manufacturers:

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

THE OHIO INJECTOR COMPANY
Wadsworth, Ohio
OIC VALVES Bronze, Iron, Cast and Forged Steel for all purposes.

HARRISBURG STEEL CORPORATION
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

GLOBE MACHINE & NIPPLE CO.
Houston, Texas
Arrow Brand Pipe Nipples—All Kinds.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types Oil COUNTRY BOILERS.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels. Prevents spillage—easily loaded.

STEEL FORGING, Inc.
Shreveport, La.
Weld Saddles and Weld Sleeves.

THE GORMAN-RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps

KINZBACH WHIPSTOCKS

First with oil men for 29 years

Leading oil operators the world over use Kinzbach Whipstocks for side-tracking, straightening and directional drilling operations. They can be set at any depth, requiring no support for the bottom. Positive setting slips prevent slipping or turning in hole. They can be oriented to mill out in any direction. Patented hinge arrangement assures that top of Whipstock will lie close against pipe walls at all times, permitting easy passage of drilling tools. Setting trigger always sets Whipstock between couplings so mill-out is always within one joint. Available in all popular sizes of casing.

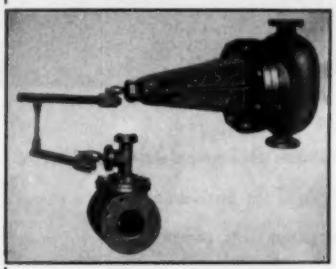
KINZBACH TOOL CO., Inc.

P. O. BOX 277 ● HOUSTON, TEXAS

EXPORT OFFICE: 74 Trinity Place, New York, N. Y.

KINZBACH TOOL CO INC

FLOAT CAGES



● No. 161D Packless Float Cage actuating No. 66B Packless Balanced Valve.

FOR LIQUID LEVEL CONTROL SERVICE

DAVIS Float Cages are used in connection with closed tanks where fluctuation of the fluid level within the tank is the governing factor in the control of all types of electrical switches, control valves, pilot valves, (for operation of diaphragm motor valves), motors and other equipment. Davis fluid control equipment also includes internal float units for direct or pilot operation. Whatever your requirement may be, Davis can supply you with a combination of float cage and control valve to make your control accurate, positive, and dependable.

Drop us a card today for detailed information on the Davis line. Ask for Bulletin 101AA.

DAVIS REGULATOR COMPANY
2543 So. Washtenaw Ave., Chicago 8, Ill.

Industrial rubber products especially built for LONG SERVICE

PIONEER

Pioneer Products are built for "heavy weather"

Much Pioneer hose is used for refueling U. S. Naval vessels at sea. (Official U.S. Navy Photograph)

One look at this dramatic photograph shows the kind of life that fuel hose leads at sea. Snaked out over the chasm between two rolling ships, this petroleum hose permits the transfer of hundreds of tons of fuel in a very short time. Flexibility, durability, resistance to petroleum products, to salt air and salt water are just a few of the qualities Pioneer Rubber Mills builds into the hose used for this purpose.

Do you have a situation that calls for a "heavy weather" industrial rubber product? Consider calling in the Pioneer organization for its exceptional service, truly long-life products, and 63 years of specialized experience. Call our nearest representative or write to the Pioneer office for his name.

PIONEER RUBBER MILLS

Pioneering in rubber since 1888

BRANCHES: CHICAGO · CLEVELAND · DALLAS
LOS ANGELES · MILWAUKEE · ST. LOUIS · SAN FRANCISCO

FACTORIES: PITTSBURG, CALIFORNIA

BELTING · INDUSTRIAL HOSE · FIRE HOSE · PACKINGS
RUBBER COVERINGS AND LININGS, SPECIALTIES

MAIN OFFICE: 345-353 SACRAMENTO STREET, SAN FRANCISCO 11

Distributors in other principal cities

quantities of water would aggravate the caving of the shale exposed in the open hole to such an extent that a flood would be rendered uneconomical. Consequently, it can be concluded that the present casing program reduces the ultimate production of many wells by approximately 50 per cent.

Further, the present casing program practically forestalls any possibility of applying new production techniques or treatments to the wells. For example, pressure fracturing of the formation could be tried on old wells with reasonably continuous sand bodies if it were not for the manner of completion which precludes the isolation of the sand from the shale above. Similarly, other difficulties prevent the employment of many techniques currently employed in other areas, not to mention the many methods that will be developed in the future as emphasis turns to increasing reservoir recoveries.

Formation Shooting and Fracturing

The Clinton sand, being a hard, well-consolidated sand of limited permeability, generally responds nicely to shooting. The practice of shooting producing formations in the Appalachian area is possibly the most effective completion tool presently at the disposal of the operator. However, the abuse of shooting practices may well be resulting in additional expense to the operator without a corresponding improvement in capacity of ultimate production. The major difficulty arises from the fact that most operators prefer to shoot their wells just as heavily as possible which results in excessive cleanout time.

Lateral fractures . . . Many operators feel that by shooting heavily they obtain lateral formation fractures, but there is much evidence available that extended fractures in the formation are unlikely to be formed as a result of shooting. Many locations can be found where two wells very close together were unable to break through to each other by shooting. For example, a case was cited to the writer in which two companies were "fighting a line" in Venango County, Pennsylvania, where two wells were drilled approximately 40 ft. apart and although both wells were shot, one of them repeatedly one of the wells was a producer and the other a dry hole in the same sand at identical depths. Many similar instances can be cited by most cable-tool hands and this evidence certainly indicates that extensive lateral fracturing of the pay by shooting is extremely unlikely.

Pressure fracturing . . . The further development of pressure fracturing, the formation of a fracture by the application of pressure to a viscous fluid, may at some future time supply the means of creating an extended fracture in the pay. However, it presently appears that the cost of $1,500 to $2,500 will require too long a payout time to warrant its use in the district. Also, the use of the method throughout the eastern area has not met with the success which has been experienced in other parts of the country. According to a recent report out of 20 open-hole completions treated throughout Illinois, Kentucky, and Indiana, only 45 per cent were deemed successful.[5]

To the best of the writer's knowledge the only pressure fracturing of the Clinton sand was performed in August 1951, on a gas-storage well in Ashland County. The well had casing cemented on top of the Clinton with an estimated

RED DEVIL

"DIA-HARD" PISTON RODS

For high pressure abrasive service

RED DEVIL Piston Rods are first choice where drilling conditions are severest because of the extreme hardness of the deep HIGH-CARBON wear resistant "DIA-HARD" case, coupled with tough core properties which give the highest tensile strength against breakage. All rods are hardness tested and precision gauged to maintain a world-wide reputation for quality. Write for Catalog No. P-101.

RED DEVIL **PISTON PULLER**

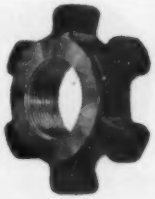
For tapered type rods

The usual practice of removing pistons from rods by blows of a sledge hammer often damages either pistons or rods. A Red Devil piston puller easily and quickly removes badly stuck pistons without injury to either part. All elements are made of finest quality alloy steel, heat-treated for strength and long life. Write for Catalog No. P-106.

RED DEVIL **PISTON ROD LOCK NUT**

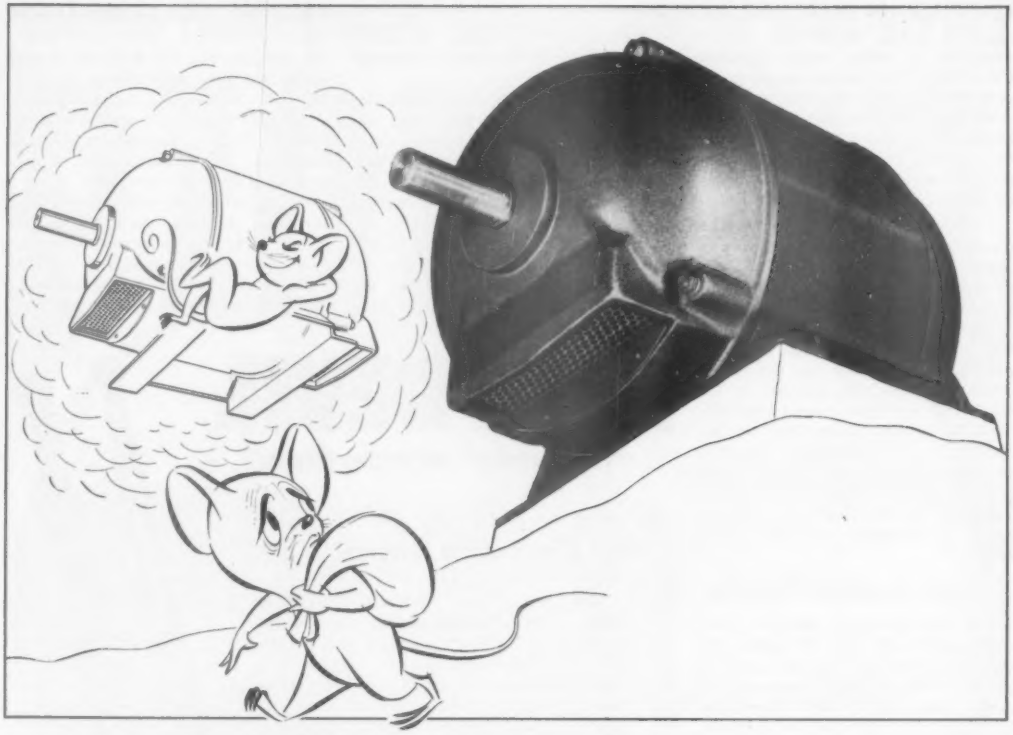
These "Hammer Lug Type" nuts provide a fast and positive means for locking piston rod in crosshead. Made from alloy steel and heat treated, they will last indefinitely. Face of nut is precision machined for full seating surface at right angles to axis of threads to prevent fatigue stresses in rod. Write for Catalog P-102.

Complete information in Composite Catalog or write for price catalogs noted above. Red Devil products are available through your supply store.



OIL WELL MANUFACTURING CORP.

6002 South Alameda St., Los Angeles 1, California



even a **FIELD MOUSE** knows the difference!

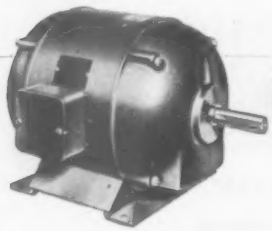
There's an R & M "All-Weather" motor that's built for YOUR job!

Triple-Rated—for changing power needs. Slight additional cost is quickly written off by power savings. You buy power only for the connected horsepower you need. As requirements change, you change the horsepower—*without changing motors.*

High Slip—ideal for the reciprocating load requirements of oil pumping.

High Torque—to meet heavy starting problems.

Standard Integrals—from 1 to 125 horsepower.



If there ever was a motor that riles a rodent, it's the R & M "All-Weather" motor! There's just no possible way for pack rats, snakes or field mice to get inside . . . because R & M motors are ratproofed at the factory, *at no extra charge!*

Of course, that's only one of the many features oil producers have come to know and appreciate about R & M "All-Weather" motors; *exclusive* features like these:

Full-height shrouded end-heads—to protect internal parts against damage. Screened openings are R & M "Weatherized."

Specially treated inside and out—to resist moisture and corrosion. Install them anywhere outdoors: no cover required.

End-to-end "clean-sweep" ventilation makes them cool-running, **year after year, at full capacity . . . with the extra stamina to take on overloads when necessary.**

Oversize bearings, sealed against dust and moisture, don't need lubrication for years.

To top it off, all these features of R & M "All-Weather" Motors are sold at a *standard motor price!* Ask any oil producer who's using R & M motors . . . he'll tell you they are the finest oil field motors your money can buy!

Get this Bulletin

Our bulletin, "Oil Field Motors" contains detailed information on construction and service, specifications. Write for a copy, and the name of your nearest R & M distributor. Robbins & Myers, Inc., Motor Division, Springfield 99, Ohio.

R&M "All-Weather" Oil Country MOTORS

Robbins & Myers, Inc., Motor Division, Springfield, Ohio, Brantford, Ont.

®"All-Weather" is a trademark of Robbins & Myers, Inc.

4 ft. of net pay in the base of the Clinton. The well was never shot and after plugging back to the pay, a pressure fracturing process was applied with the result that the open flow was increased from 81 to 720 M.c.f. This indicates that pressure fracturing of the Clinton could be accomplished on some wells if casing to the top of the Clinton were provided. Even if the method is employed in a completion, there may be much to be gained by cleaning the sand face with a light shot after the operation.

The pressure-fracturing treatment combined with a light shot may so reduce cleanout time and so increase the well's capacity that it will prove to be economical, but the evidence to date does not warrant a recommendation of the pressure-fracturing process at this time. The use of several similar processes employing cheaper fluids and resulting in more economical treatment are currently being developed and may in the near future prove to be of value in this area.

Beneficial shooting . . . Since extensive lateral fracturing of the Clinton sand upon shooting is extremely unlikely, the only other apparent reason to be cited for the very heavy shooting of the Clinton sand is that it would result in a much larger hole. On the surface it appears that a large hole through the pay is extremely beneficial to the rate of production. However, it can be shown through the mathematics of fluid flow that a well with a ½-ft. diameter and a drainage radius of 660 ft. would have to have its bore-hole diameter increased to approximately 26 ft. in order to increase production by a factor of 2.[6]

Although caliper logs indicate many holes having a diameter in excess of 30 in. and a case can be cited of an entire string of tools being lost in a shot hole and never again contacted, the formation of a 26-ft. hole upon shooting is inconceivable. Further, since shooting generally increases production by many times a factor of two, it appears that shooting serves some other major purpose that results in considerable increases in production.

As suggested previously, there is reason to believe that during drilling in and cleaning out, the sand is effectively plugged and the removal of this plugged sand from the sand face appears to be the major reason for the increased production resulting from shooting. In the case where the well is completely plugged the apparent increases in production capacity will be infinitely large and can account for practically any magnitude of production increase.

Apparently the removal of the plugged sand is the most beneficial result of present shooting methods. Consequently, the size of the shot currently employed in the shooting of Clinton sand producers could be substantially reduced without curtailing the effect of the shot. For although water contamination of the formation may exist to a depth of several feet around the bore hole, the actual plugging of the formation due to mud particles could not conceivably exist to a radial depth of more than a few inches.

Heavy shooting . . . In addition to the desire to laterally fracture the formation and form a large hole the following are at least partially responsible for the attitude that the larger the shot the better the production possibility:

1. For most other remedies it appears true that, "if a little is good, more is better."
2. It costs very little more to shoot

ASK THE ROYAL ABOUT CANADA'S OIL
Branches throughout Canada's oil-rich western plains. On-the-spot information available through J. C. Mayne, Supervisor, Calgary, Alberta, or Head Office, Montreal
Assets exceed $2,500,000,000
We do not provide information on oil securities
THE ROYAL BANK OF CANADA
Over 760 branches in Canada and abroad

PIPE LINE BOOSTER PUMPING

MARLOW self-priming centrifugal pumps make it easy to dependably feed oil to the main lines of gathering systems. For example: The Marlow shown below is one of those in use at Shawnee, Oklahoma, transferring oil from isolated tank batteries at the rate of 120 bbls. per hour at 43 lbs. pressure.

A Marlow is so simple, rugged and foolproof that it requires practically no attention and will last indefinitely. You can rely on Marlow pumping.

As manufacturer of the world's largest line of self-priming centrifugal pumps, Marlow can help you to have a better gathering system. Write us about your problem without obligation.

MARLOW PUMPS
544 Greenwood Ave.
Ridgewood, N. J.
Engineers and Representatives Everywhere

with a large shot than with a small shot.

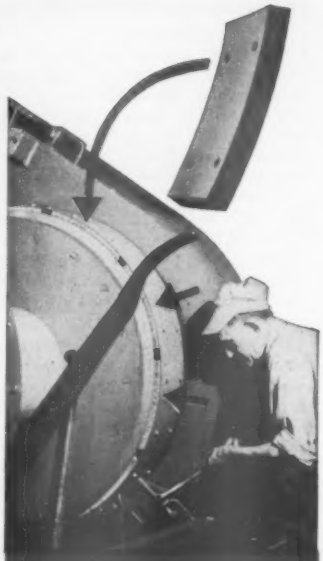
3. Shooting is often left entirely to the service company which may be unconsciously prejudiced toward heavy shooting.

Although it is fully realized that a comparison between wells producing from the Clinton sand is practically worthless as a result of the extreme variation in saturation and permeability, extremely heavy shooting fails in all cases to add substantially to the rate of production, and also is a major contributor to the required cleanout time. Although the Clinton is a very hard and highly consolidated sand, it appears to be very brittle, and consequently, the shooting of it acts upon the sand much as would the striking of the sand face with a drill bit. In other words, upon shooting it disintegrates to such an extent that it becomes largely unconsolidated for a considerable distance from the well bore.

Further, the large shot unnecessarily disturbs the shale above the Clinton and causes substantial caving from that member. It might well be that the shale cave is more detrimental to the well than the sand cave for, by mixing with the unconsolidated sand, it reduces to a considerable extent the permeability of the loose sand in the hole.

Shaped-charge shooting . . . Further development of shaped charges may remedy the devastation presently resulting from shooting. By focusing the energy of the explosion on certain areas the blasting effect and the resulting pulverization of the sand may to some extent be eliminated and the formation caused to break into much larger pieces.[7] The focusing of the explosion is brought about by making indentations in the explosive body and since, according to the Munroe effect, expansive force is expended in a direction perpendicular to the surface of the explosive, such force when developed from any point on a symmetrical indentation meets equal force from all other points on the indentation, and the combined energy is liberated in the direction of the axis of the indentation.

Use of shaped charges in shooting the Clinton sand has decreased cleanout time somewhat, but this is to be expected without a shaped-charge effect since the shells contain approximately 80 per cent less explosive than the conventional shell. Since it has been possible to so confine and direct the energy of a shaped-charge explosion that it is widely employed to perforate cemented casing, there is



for round the clock operation choose Thermoid

Emsco Drawworks represent the most advanced engineering design for continuous drilling. These units operate 24 hours a day, seven days a week, under highly severe conditions.

Small wonder that Thermoid TX Oil Field Woven Brake Blocks are original equipment on Emsco Drawworks. Thermoid makes Brake Blocks that provide reliable performance and uniform friction. Long wear cuts down change-overs which cost valuable operating time.

Thermoid has 70 years of experience in the field of friction materials for a wide variety of industries: petroleum, automotive, transportation, agriculture and others. This experience, plus close attention to individual manufacturers' needs, is your assurance of safer, longer brake life . . . less maintenance cost . . . with Thermoid TX Oil Field Woven Brake Blocks.

Mid-continent Offices and Warehouse Houston, Texas

Thermoid

Thermoid Company, Trenton, N. J.

easier to coil, easier to handle
Trioflex Rotary Hose

Thermoid Industrial Rubber Products — Quality Service

For portable drilling units, work-over rigs and seismograph work, Thermoid Trioflex Slim Hole Hose is a natural. Its light weight, flexibility and resistance to kinking make it easy to handle, transport and store.

- Tube—synthetic rubber . . . resists oil and abrasion.
- Reinforcement—braided steel wire for light weight, maximum strength and extreme flexibility.
- Cover—specially compounded, synthetic rubber . . . resists abrasion and weather.
- Couplings—male . . . factory assembled . . . guaranteed to stay secure for the life of the hose.
- Every length is pre-tested to 2000 psi.

Get full information about Trioflex Hose from your supply house . . . or call us.

Mid-Continent Office and Warehouse: Houston, Texas
California Office and Warehouse: Los Angeles

Thermoid

Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

NEW

NEW from SKF

the HESS-BRIGHT "SY" UNIT PILLOW BLOCK

A new Unit Pillow Block, designed by SKF to meet tomorrow's needs of modern industry.

Here are the design features:

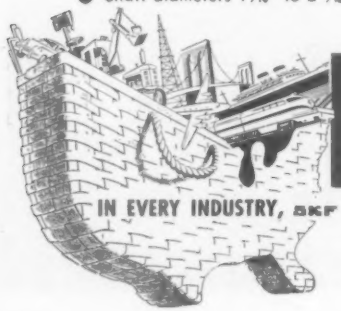
- SKF Red Seal, made of DuPont Fairprene, retains lubricant. Wiping action of the seal against the inner ring is practically frictionless.
- Rotating flingers exclude dirt.
- Set screws for ease of installation.
- Spherical outer ring compensates for initial misalignment.
- Alemite fitting for re-lubrication.
- Interchangeability with existing installations made possible by bolt hole spacing and center height features.
- Shaft diameters 1 3/16" to 2 15/16".

Hess-Bright Pillow Blocks

Detailed illustration of rotating flinger and RED SEAL—the extremely light tension contact seal.

From now on, the name to remember in Unit Pillow Blocks is HESS-BRIGHT "SY"—manufactured in our plants, to the same high quality standards as all SKF products. Ask your SKF Distributor to show you the HESS-BRIGHT "SY"; or write SKF direct for complete information on this *newest* Unit Pillow Block.

SKF INDUSTRIES, INC., Phila. 32, Pa.—*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.* 7322-A



SKF®
BALL AND ROLLER BEARINGS

IN EVERY INDUSTRY, SKF Puts The Right Bearing In The Right Place

every reason to believe that it can in the future be similarly employed to obtain the most effective open-hole shot.

Shooting recommendations. . . . In addition to reducing the shot size and investigating the possibilities of shaped-charge shooting, the writer recommends:

1. Selective shooting: accurately logging the sand by not less than 2-ft. intervals and shooting with spacers set accordingly.

2. Refraining from shooting the top of the Clinton sand; this may permit the top of the sand, which is never productive, to remain in place and act as a support for the overlying shale.

3. Tamping shots by placing gravel or a calseal plug on top of the shot either the shale overlying the Clinton is protected from caving or the casing is protected from damage as the case may be.

Cleanout Necessity

The deterring effects of the extended cleanout were noted previously and as might be suspected, there is some evidence that they may offset and possibly overshadow the desirable effects of the cleanout.

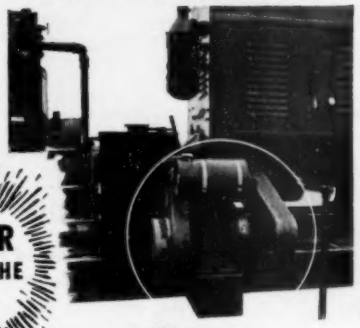
One independent operator in Perry County does not clean out his wells, but after shooting the well sets a liner and prepares for immediate production. This practice was initiated as an economy when the price of oil was very low, but after the price increased the operator again reverted to the conventional completion method. However, after repeatedly noting the drop in production following the primary cleanout, he once again bypassed the cleanout on a completion in 1936 with the result that the production did not fall off nearly as rapidly and was believed to be considerably higher than would have been possible with the conventional completion method.

Although exact figures, representing evidence, could not be amassed, the royalty owners contacted on many of the operator's leases wholeheartedly agree that bypassing the cleanout has given much better results than the conventional method employed on other leases in the vicinity. One of the pumpers, who pumps several of the subject operator's wells, in addition to wells of other operators, stated that he was very skeptical of the results that would be obtained when the method was revived in 1936, but he has become completely convinced that bypassing the cleanout results in production superior to that obtained by the conventional method of completion. In addition to the increased production apparently resulting from this method, the producer also saves the cost of the cleanout, which may represent $1,000 or more.

Experience has revealed that there is never any undue difficulty in applying this method of completion. Before shooting, the liner is assembled and about half an hour after shooting the tools are run into the hole to check for possible casing collapse after which the liner is placed on bottom. Approximately 80 per cent of the time it is reported that the liner goes to bottom since the sand has not settled and is therefore very loosely packed. The evidence indicates that most of the sand flows into the hole when the hole is swabbed and continues to slough off of the formation as the sand in the bore hole is removed.

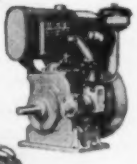
Although the evidence stated above is of an inexact nature, it certainly in-

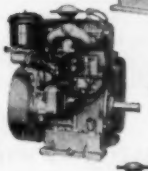
ONE DAY'S OIL SAVING
Pays for This
WISCONSIN-
Powered Starter

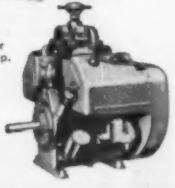


POWER TO FIT THE MACHINE
POWER TO FIT THE JOB

4-cycle single cylinder 3 to 6 hp.


4-cycle single cylinder 6 to 9 hp.


2-cylinder models 7 to 13 hp.


V-type 4-cylinder 15 to 30 hp.

Typical of the constantly expanding service applications for Wisconsin Heavy-Duty Air-Cooled Engines in the oil field is this efficient starting unit. Being gas-powered, this arrangement permits engines to be turned for any length of time instead of just for a few minutes as is customary with a battery starter. According to reports from users, it is not uncommon to have the Wisconsin Engine installation pay for itself through a single day's oil saving.

The Wisconsin Air-Cooled Engine was chosen for this type of specialized service because of its dependability, the simplicity of design, heavy-duty service features, the easy access of operating adjustments and its weather-proof characteristics.

An interesting accessory included in the starting unit here shown, is the heavy-duty, totally enclosed, positive action (at all speeds) Twin Disc Clutch . . . designed to prevent possible injury to workmen and providing complete protection against sand and dirt. This prevents wear to which outside yoke types are ordinarily subjected.

For the ideal power to fit both the machine and the job . . . you can't do better than to specify "Wisconsin Air-Cooled Engines" . . . 3 to 30 hp., single cylinder, 2- and V-type 4-cylinder models.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
619 S. MAIN STREET, TULSA, OKLAHOMA
M & M BUILDING, HOUSTON, TEXAS
503 SOUTH MAIN ST., WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS.

A 7196-½

Specially Compounded For Both New Equipment and Maintenance Installations

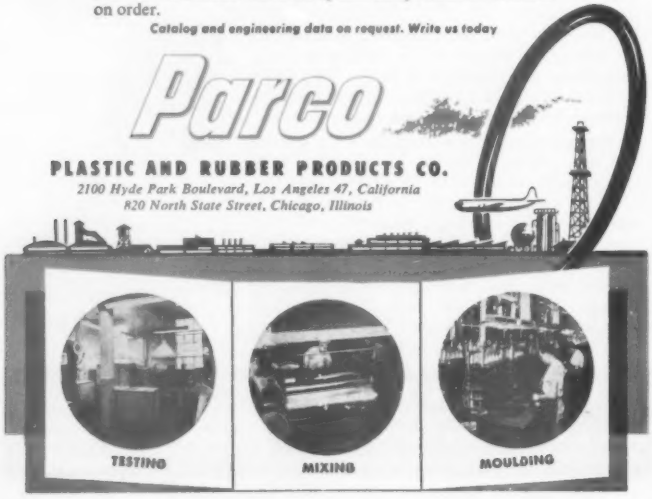
In the drilling, refinery or pipeline operation on both new equipment and maintenance work, specially compounded Parco "O" Rings do the job better. Parco "O" Rings are rubber combinations blended to meet your specifications and molded to tolerances that make them superior seals for both static and dynamic use. For your assurance and best protection of smoother running and longer wearing hydraulic seals, insist on Parco. Other Parco rubber products used in the oil industry meet the same high standards of Parco "O" Ring quality Specify a superior product at no premium to you. All dash numbers of 6227, 6230 and 6290 series for commercial applications or Army-Navy installations to Specifications MIL-P-5516 (6227 and 6230) and MIL-G-5510 (6290) are available from stock. Silastics and other special compounds are available on order.

Catalog and engineering data on request. Write us today

Parco

PLASTIC AND RUBBER PRODUCTS CO.

2100 Hyde Park Boulevard, Los Angeles 47, California
820 North State Street, Chicago, Illinois



dicates that little if anything is gained by the primary cleanout of the wells in Perry County.

Reverse circulation . . . There is one other method which indicates that an extended cleanout is unnecessary. The writer recently observed the reverse-circulation cleanout of a number of 3,000-ft. open-hole completions in Big Foot field in Texas. These wells are very similar to Perry County producers in that they are relatively low-pressure wells with somewhat marginal production. The pay horizon is not shot but being a soft to friable sandstone its physical condition compares with that of the Clinton sand following shooting. Such a soft friable sand could be expected to cave into the open hole endlessly, particularly in the absence of a liner, but by reverse circulation the wells are cleaned out in 2 to 3 days.

The reverse circulation rig is simply a light, portable mast type pulling unit which uses the tubing to reverse circulate the cave from the hole. This is to say the tubing is run to the bottom and circulation set up by pumping oil down the annular space between the tubing and casing and up the tubing. The rig is equipped with a small rotary table and kelly which facilitates the rotation of the tubing string thereby breaking up any pieces of cave too large to pass through the bit. In this manner these rigs appear to remove more cave from the Big Foot holes in 2 to 3 days than is customarily removed by bailing from the hole of a Perry County well in 4 or 5 weeks.

Consequently, the writer believes that following present casing and shooting practices a reverse-circulation rig could clean out a Clinton sand producer in 3 to 4 days and since the prevailing rate for such service is $15 to $16 per hour, it can be readily seen that a substantial savings could be realized by the operator.

References

1. Miller, George, "Oil-Base Drilling Fluids," Petroleum Engineer, p. 94, July 1947.

2. Nowak, T. J., and Krueger, R. F., "The Effect of Mud Filtrate and Mud Particles Upon the Permeabilities of Cores," World Oil, July and August, 1951.

3. Stone, John B., "Use of Plastics in Cable-Tool Drilling," Drilling Magazine, pp. 41-42, October 1945.

4. Lockett, J. R., "Proposed Method of Setting Liner and Packer Assembly Instead of Casing," Ohio Fuel Gas Co.

5. Hassebrook, W. E., "Application and Results of the Hydrafrac Process," World Oil, p. 133, February 1951.

6. Muskat, Morris, "Physical Principles of Oil Production," McGraw-Hill, 1949.

7. "New Oil-Well Shooting Methods," The Oil and Gas Journal, pp. 86-89, April 12, 1947.

DOMESTIC OR FOREIGN

PILE FOUNDATION RIG, LOUISIANA MARSH AREA

BARGE RIG, CORPUS CHRISTI BAY

AT XICALANGO, MEXICO

IN FREMONT COUNTY, WYOMING

There's a

KERR-McGEE Rig

for Every Type of Drilling . . .

★ Land Locations
★ Inland Waters
★ Offshore

KERR-McGEE
DRILLING CONTRACTORS
OIL INDUSTRIES INC.

Kerr-McGee Building Oklahoma City

EXPERIENCED MEN WITH THE RIGHT EQUIPMENT FOR ANY DRILLING JOB

THE *Profitable* COMBINATION

Your PETROLEUM HEATERS *fired with* NATIONAL AIROIL

OIL-GAS

TANDEM COMBUSTION UNITS

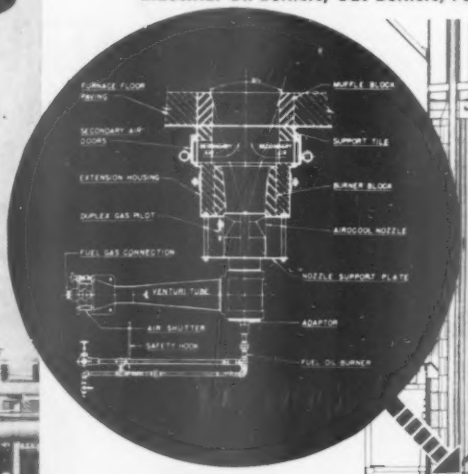
. . . we'll be glad to tell you just *how* and *why* NATIONAL AIROIL Tandem Block Combustion Units (for vertical firing) will bring *longer service* "on stream" and *higher profits* from YOUR process oil heaters!

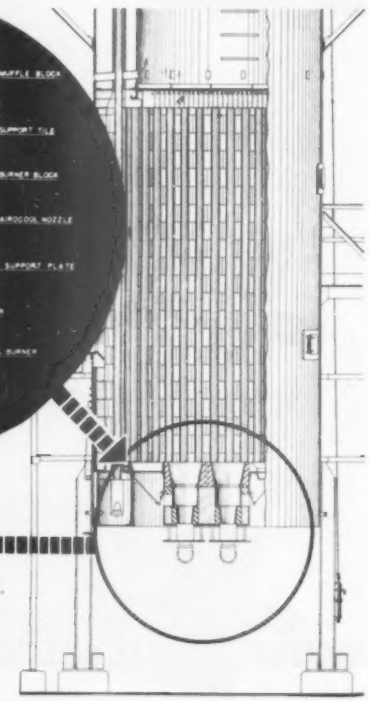
CHEMICAL-PETROLEUM DIVISION

NATIONAL AIROIL BURNER CO., INC.

Main Office & Factory: 1236 EAST SEDGLEY AVE., PHILA. 34, PA.
Southwestern Division: 2512 SOUTH BOULEVARD, HOUSTON 6, TEXAS

Industrial Oil Burners, Gas Burners, Furnace Equipment





This petroleum heater is by Foster-Wheeler Co. . . . and is fired vertically with four of our popular NATIONAL AIROIL oil-gas Tandem Block Units. (Just one of many, many similar NATIONAL AIROIL installations throughout the U.S. and other countries.)

Here are some new ideas on the

Classification of Oil and Gas Wells

• by J. C. Allen*

A Review of the Properties of Some Oil and Gas Reservoirs

SINCE the first production of petroleum hydrocarbons from underground reservoirs, the producing wells have been placed in two general categories, viz., oil and gas. The hydrocarbons produced have varied from field to field in composition and properties from asphaltic mixtures that are heavier than water to substantially pure methane, the lightest hydrocarbon gas. Gas fields were discovered which produced a water-white liquid at the well head similar in many properties to motor fuel and was termed "casing head" or natural gasoline. This type of underground gas contains heavier hydrocarbons than methane and these constituents condense at the surface because of the temperature dropping below the dew point of the system.

With the advent of deeper drilling, new pools were discovered which produced gas and a liquid at the surface that was at first termed "white oil" because it was considerably heavier than the casing-head gasoline. It was shown that these white oils exist in the subsurface formation as a gas due to retrograde phenomena.[1,2] The produced liquid varies in color from water white to dark straw, and has gravity ranges from 47° to 66° A.P.I. Having similar properties to a refinery cut termed distillate, these wells were at first called distillate wells. The term condensate was later applied because the produced liquids are formed by retrograde condensation.

Prior to the discovery of condensate reservoirs, the classification of fields was based solely upon the produced gas-oil ratio.

An early gas-condensate-reservoir discovery made this method of classification inadequate. In a paper presented at the A.I.M.E. meeting held in Oklahoma City in October 1937, E. A. Stephenson[3] stated: "A much more precise concept of the distinction between an oil well and a gas well was given in 1936 by the federal judges for the Western District of Texas (Austin division) in the case of Clymore Production Co. vs. E. O. Thompson et al. (the Texas Railroad Commission). The plaintiff (Clymore) owned a few wells which it classified as oil wells, although these had gas-oil ratios of 86,500 cu. ft. per barrel.

Gas at the rate of 45 million cubic feet per day was being blown into the air in order to produce about 500 bbl. of crude oil. The waste of the gas produced with such oil was depleting a valuable reservoir, which was more or less essential to the supply of a large natural-gas system; therefore, the commission had ordered the wells shut in, and had also refused to issue tenders for the sale of the crude oil." Litigation developed when Clymore endeavored to restrain the commission from enforcing its orders.

"In preparation for the trial, it was recognized that the technical data would need to be presented in the simplest possible form, and that some field experiments should be conducted.

"As a result of these experiments, it was found that the 'oil' was in reality a 'condensate,' the formation of which appeared to be induced by the fall in pressure and in temperature that took place in the tubing and chokes."

The problem of classification became more complex when reservoirs were discovered that contained both a "black oil" column and an overlying gas-condensate cap. In some instances the black-oil column does not underlie the entire productive zone, but is found only on the periphery or in a part of the structure downdip. There are other combination reservoirs which have such thin intervals that it is impossible to complete a well that will produce only from the oil column. High draw-down pressures around the well bore can cause the gas phase to funnel downward with the subsequent production of gas-cap material, even though perforations may only be in the oil column. For this type of reservoir, gas-oil ratio cannot be the criterion for classification purposes because it is affected by the production rate.

Another type of reservoir has been discovered in recent years which further complicates an exact classification. These pools produce a stock-tank liquid having identical properties to some condensate liquids. However, the gas-oil ratio is low enough that the virgin hydrocarbon mixture exists in the reservoir not as a gas, but as a liquid, the gas being in solution. A review of condensate reservoirs has been reported[4] which describes this type of reservoir. A limited amount of laboratory data have been reported on these "liquid-condensate" reservoirs.[5] It was pointed out that the produced gas-oil ratio is not the only variable that governs the phase condition in the reservoir.

The majority of black oils that are saturated with gas in the subsurface horizons contain less than 1,000 cu. ft. of solution gas per barrel of produced oil. Recently, a P-V-T study was reported on subsurface samples of oil from the Bromide sand of the Simpson formation, Lindsay field, Oklahoma.[6] Liberation of the solution gas from one subsurface sample revealed 2,900 cu. ft. of gas per barrel of residual oil. This sample had a bubble-point pressure of 4,800 psi., which compared favorably with the bottom-hole pressure. Because of the dark color and other properties of the produced oil, it could hardly be termed a liquid condensate, but rather a high-gravity (47.1° A.P.I.) black oil.

The gravities of the gas and liquid phases as a function of pressure at reservoir temperature tended to converge at the high pressures. By extrapolating these curves above the bubble-point pressure (4,800 psi.), it was concluded that at a single-phase pressure of 5,200 psi. the densities of both phases would be identical and a critical state would exist. These observations indicate that at single-phase pressures above 5,200 psi. retrograde dew points could exist. This would mean that some high-gravity black oils might exist in underground reservoirs in the gaseous state.

CLASSIFICATION of oil and gas wells, based entirely upon the ratio of gas and liquid as they exist at the surface, is inadequate. A recent trend in well classification is based on amount of gas measured at the surface, per volume of liquid existing underground. This, too, is inadequate.

A condensate-type liquid can exist in the formation either as a gas or liquid. It has been shown in the laboratory that a system now referred to as black oil can be made to vaporize at 145° F. and 5,700 psi. pressure. High-gravity black oils containing several thousand cubic feet of solution gas per barrel exist underground. It is entirely possible that reservoirs will be discovered that produce what is termed "black oil," but the virgin system will exist as a vapor.

Certainly these types of systems should not fall into the same category as low-gravity, low-ratio wells.

Experimental data on 10 hydrocarbon mixtures from 6 fields have been obtained and analyzed. The fields were chosen as examples of gas-phase reservoirs, combination reservoirs, and liquid-phase reservoirs. These data show there is a smooth transition from one type reservoir to another, and that in the approximate gas-oil ratio range, 3,000 to 7,000 cu. ft. per barrel, the state in which reservoir fluids exist underground is uncertain. The state depends on temperature, pressure, and character of the produced gas and liquid.

Field A . . . Fig. 1 shows the volumetric behavior at 251° F. of 10 mixtures of separator gas and liquid. The liquid volumes are cubic feet per pound of mixture. Gas-oil ratios of 4,000 cu. ft. per bbl. and over exhibited dew points; whereas ratios of 3,800 cu. ft. per bbl. and lower exhibited bubble points. Fig. 2 is a pressure-composition diagram of the foregoing data. The phase boundary curve is not continuous at the critical state.

This unusual behavior has been reported in the literature once before.[7] The mixture being studied was a gas condensate at low temperatures. An excellent discussion of this phenomenon

*The Texas Co., Bellaire, Tex. Presented at the spring meeting of the Southwestern District, Division of Production, American Petroleum Institute, Shreveport, La.

take a **CLOSER LOOK** at this

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION

General Offices & Plants

Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. • Cleveland 14, Ohio • Denver 1, Colo. • Detroit 26, Mich. • Houston 19, Texas • Los Angeles 17, Cal. • New York 16, N. Y. • Philadelphia 2, Pa. • St. Louis 1, Mo. • San Francisco 3, Cal. • Syracuse 2, N. Y. • Toronto, Ontario • Tulsa 3, Okla.

B&W SEAMLESS and WELDED TUBES

JA-16965

WEALTH OF TUBING DATA

TB TECHNICAL BULLETIN

TDC TECHNICAL DATA CARD

TR TECHNICAL REPORT

Tube engineering data . . . prepared by engineers for engineers . . . pours out of Babcock & Wilcox headquarters in an endless stream of technical literature and other communications, to keep designers, equipment manufacturers and process engineers well-informed about latest tubing developments and applications, and to provide an interchange of field experience among tube users.

Important findings of metallurgists and application engineers, of chemists and of all the other specialists concerned with pressure and temperature requirements and special tubing needs are condensed and published in ready-reference form as fast as data can be reviewed and verified.

B&W offers a most comprehensive file of information available on carbon, alloy and stainless tubing, both seamless and welded —the technical help this literature offers is exceeded only by the personal assistance on specific tubing problems you may expect from B&W field representatives.

If you want facts where you can find them —tips to help you speedily solve tubing problems and to suggest ideas for greater tubing service satisfaction—send for B&W bulletins you may select from this partial list of current data.

YOURS FOR THE ASKING

- ☐ TB-19 B&W Stainless Croloy Tubing Steels, Seamless and Welded, Condensed Technical Data
- ☐ TB-1 Properties and Methods of Working Seamless and Welded Tubes and Pipe of the B&W Stainless Croloys
- ☐ TB-332 B&W Stainless Pipe, Seamless or Welded
- ☐ TDC-130 B&W Stainless Pipe and Tubing Croloy 18-8S (Type 304), for Pressure and Mechanical Uses
- ☐ TDC-132 B&W Stainless Pipe and Tubing, Croloy 18-8 Cb (Type 347), for Pressure and Mechanical Uses
- ☐ TDC-133 B&W Stainless Pipe and Tubing, Croloy 16-13-3 (Type 316), for Pressure and Mechanical Uses
- ☐ TDC-134 B&W Stainless Pipe and Tubing, Croloy 25-20 (Type 310), for Pressure and Mechanical Uses
- ☐ TDC-140 B&W Stainless Pipe and Tubing, Croloy 12 Al (Type 405) 18 (Type 430), 27 (Type 446), for Pressure and Mechanical Uses
- ☐ TDC-143 B&W Stainless Tubing, Croloy 12 (Type 410), 12-2 (Type 414), Properties and Applications
- ☐ TDC-148 B&W Croloy Stainless Steels, Condensed Data on Working Seamless or Welded Tubing and Pipe
- ☐ TA-1517 B&W Stainless Steel Tubing for the Food Processing Industry
- ☐ TB-6 Properties of Carbon and Alloy Seamless Steel Tubing for High-Temperature and High-Pressure Service
- ☐ TB-12 B&W Alloy Tubes and Pipe, Condensed Technical Data on High-Temperature Steels
- ☐ TB-328 How to Keep Down Maintenance Costs in Pulp and Paper Mills
- ☐ TB-329 B&W Heat Exchanger and Condenser Tubes, Seamless and Welded, Stainless, Alloy and Carbon Steels
- ☐ TB-344 Applications of B&W Tubular Products — Stainless, Alloy and Carbon Steel, Seamless and Welded
- ☐ TDC-136 Chemical Compositions, B&W Seamless Alloy Steel Tubing, B&W Croloy Steels of the Low and Intermediate Alloy Groups.
- ☐ TDC-138 B&W Pipe, Seamless and Welded, Carbon, Alloy and Stainless Steels, Dimensions, Weights, Specifications, Grades, Analyses
- ☐ TA-1559 B&W Steel Tubing — Seamless or Welded Stainless, Alloy and Carbon Steels—for the Process Industries
- ☐ TB-11 Specifications for Seamless and Welded Tubular Products—Stainless, Alloy and Carbon Steels
- ☐ TB-15 Weight Tables, Round, Seamless and Welded Steel Tubing
- ☐ TB-335 Descriptive Terms—Steel Tubing
- ☐ TDC-125 Hardness Conversion Tables
- ☐ TR-514 How You Can Avoid Boiler Tube Corrosion
- ☐ TR-515 The Creep and Stress-Rupture Testing of Steam-Boiler Materials
- ☐ TR-516 Some Experiences in Service, Power, Oil and Chemical Plants

CLIP AND RETURN ENTIRE PAGE

Mr. Tubes — your nearby B&W Tube Representative—will be happy to provide additional information and to discuss any specific tubing problem with you.

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

Beaver Falls, Pennsylvania

☐ Please send me the B&W bulletins checked.

☐ Please add my name to your mailing list to receive new bulletins when available.

NAME_____ POSITION_____

COMPANY_____

STREET ADDRESS_____

CITY_____ ZONE_____ STATE_____

was presented, and this observation was noted: ". . . the discontinuity and lack of uniformity observed at the critical state are believed to be due to an arrangement of the molecules in the liquid phase that prevails after the meniscus between the gas and liquid disappears."

Fig. 3 depicts the volumetric behavior of the liquid phase at 7 temperatures for a 3,800-cu. ft. per bbl. mixture. The 283° F. isotherm shows an abnormality in the liquid volume behavior. The system appeared to approach a dew point, inasmuch as the volume decreased after having steadily increased. However, there was a second reversal; and five subsequent measurements, as pressure increased, showed increases in liquid volume, thus a final approach to a bubble point.

Fig. 4 shows the same data constructed on a pressure-temperature plot. The 43.8 volume-per cent curve shows in another manner the abnormal liquid behavior near the critical state. Only one case in which this anomaly has been previously observed[1] is known to the authors. The same behavior was found for another system and will be discussed later herein.

Critical states were established for two mixtures of separator gas and liquid from Field A. An important point is that only slight changes in chemical composition can cause a change of state in which the mixture exists. These data show how it is possible to have a condensate-type reservoir that exists as a liquid.

Field B . . . Critical properties were determined for three mixtures of separator gas and liquid, and again gas was converted to liquid by slight changes in chemical composition. Fig. 5 shows the volumetric behavior of the liquid phase at 212° F. of 10 mixtures of gas and liquid. Fig. 6 is a pressure-composition diagram at 212° F. Once again, a discontinuity of the phase boundary curves appears in the vicinity of the critical state.

Field C . . . The reservoir conditions at the time of sampling were 2,350 psi. and 195° F. Volumetric data at the reservoir temperature showed that the well-production mixture represented a saturated retrograde dew-point mixture at the subsurface conditions. The liquid that is produced in the stock tank has an A.P.I. gravity of 66.6°. The gravity and molecular weight of the heptanes and heavier fraction are 53.4° A.P.I. and 114 respectively.

Fig. 7 is a partial phase diagram of the well effluent. Reservoir temperature of 195° F. is not far from the cricondentherm of 263° F. At 195° F. a conventional dew point of 150 psia. was determined as the mixture was compressed; and upon further compression a retrograde dew point was determined at 2,240 psia. This mixture of hydrocarbons has properties very close to wet gas reservoirs that do not exhibit retrograde condensation. A diagram of a wet-gas reservoir would be shifted to the left on the temperature scale so that the cricondentherm would be below the reservoir temperature.

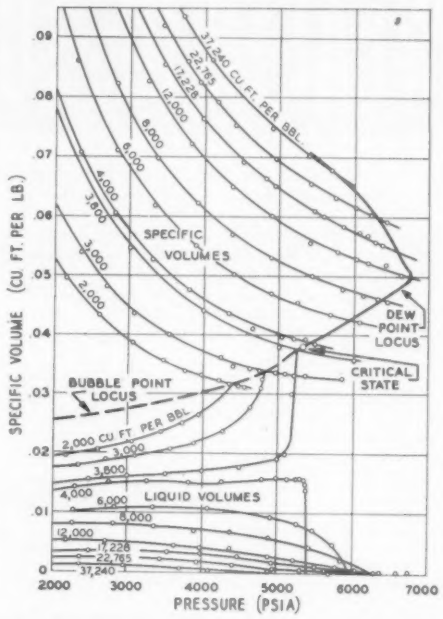


Fig. 1—Field A: Pressure-volume relations of 10 mixtures of liquid and gas at 251° F.

Here is another example of a smooth transition zone. In this case a retrograde gas-condensate system exists that has properties near those of an ordinary wet gas system.

Fig. 8 is a pressure composition diagram at 195° F. It is noted that the phase boundary curve is smooth and continuous through the critical state, similar to the more simple mixtures that have been reported. For this system, the heptanes and heavier fraction

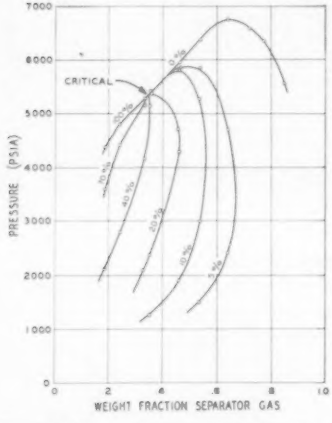


Fig. 2—Field A: Pressure-composition diagram at 251° F.

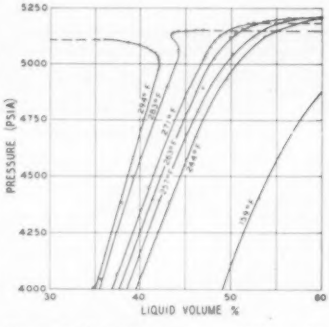


Fig. 3—Field A: Isotherms for a 3,800-cu. ft. per bbl. mixture.

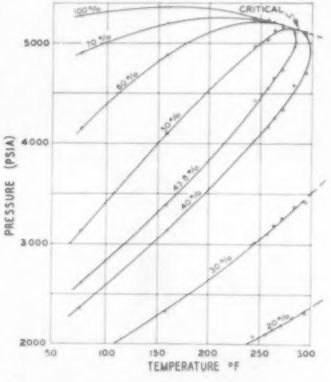
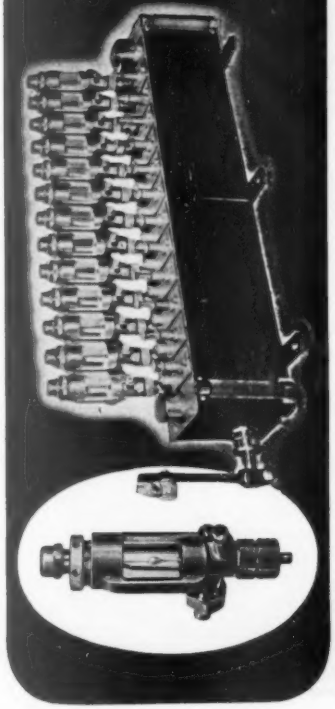


Fig. 4—Field A: Pressure-temperature diagram same mixture.

new McCORD Tubular "Clearsite" Feed SF LUBRICATOR

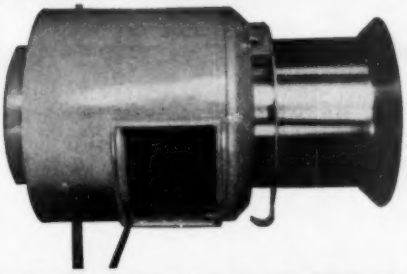
The new McCord "SF" Lubricator delivers a predetermined quantity of oil under pressure at regular intervals to cylinders or bearings. A new improved tubular clearsight feed, a McCord development, shows delivery and quantity of oil. It may be cleaned without removing from pump. Other McCord advantages are easy removal of pump units, welded steel tanks, wide variety of drives, and a new graduated oil level gauge providing greater visibility. McCord offers you an outstanding lubricator, further improved to provide better service. Deliveries are prompt.

LUBRICATOR DIVISION
McCORD CORPORATION • Detroit 11, Mich.



For Safety Unsurpassed

KELCO Safety



BREAKOUT AND SPINNING LINE CATHEADS

KelCo Safety Breakout Catheads are available in two sizes—Model 12 for light drilling rigs and servicing hoists—Model 16 for medium and heavy drilling rigs—choice of mechanical, hydraulic or air controls on either model. Tong line and patented tong block furnished at no extra charge.

AVAILABLE THROUGH YOUR FAVORITE SUPPLY STORE

Representatives in All Fields

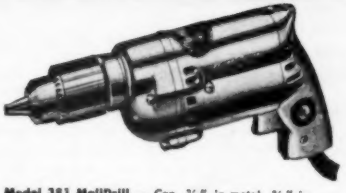
Be Safety Wise — KelCo-Ize

KELCO BEN F. KELLEY CO., Inc.
TULSA, OKLAHOMA

SPINNING LINE CATHEADS • BREAKOUT CATHEADS • AIR OPERATED POWER SLIPS
TUBING TONGS • SAFETY "C" POLISHED ROD CLAMPS

Gain MORE DRILLING POWER at LESS EFFORT... with

Mall DRILLS

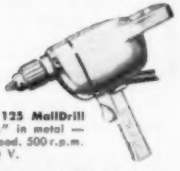


Model 381 MallDrill — Cap. ¾" in metal, ¾" in wood. Jacobs geared chuck and key. 10 ft. cord, plug, adapter. 115-230 V. AC-DC.

Wherever you need DRILLING POWER you can depend on... for steel, wood, concrete, masonry...there's a dependable, economical MallDrill for the job. Choose from a dozen different models. And write for the latest MallDrill catalog.

Model 346 MallDrill Cap. ¾" in metal — 1½" in wood. Geared chuck. 115-230 V. AC-DC.

Model 145T MallDrill Cap. ½" in metal, ½" in wood. 2500 r.p.m. Jacobs chuck and key. 115-230 V. AC-DC.



Model 125 MallDrill Cap. ½" in metal — 1" in wood. 500 r.p.m. 115-230 V.

40 Factory-Owned Service Warehouses, Coast To Coast, To Serve Our Customers and Thousands of Dealers.

Mall TOOL COMPANY
7718 S. Chicago Avenue
Chicago 19, Illinois

Clip and mail this CHECK LIST for details

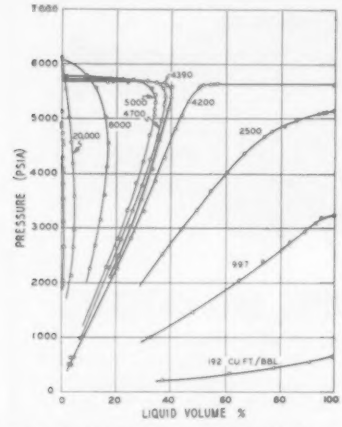


Fig. 5—Field B: Behavior of the liquid phase of mixtures of surface gas and liquid at 212° F. (Various gas-oil ratios).

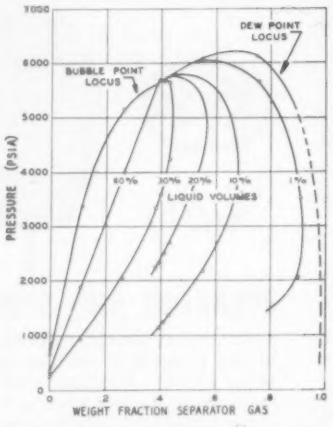


Fig. 6—Field B: Pressure-composition diagram of the gas-condensate system at 212° F. (Lines showing per cent liquid by volume.)

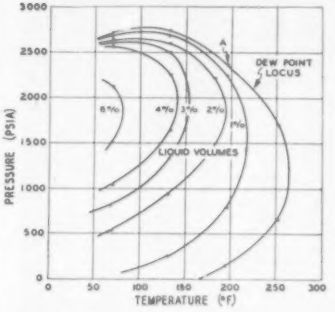


Fig. 7—Field C: Phase diagram of the well-production mixture.

is considerably lighter than for Fields A and B. Thus, it could be expected that the closer the properties are between the lightest and heaviest component, the more normal behavior they would exhibit. It will be shown later how the abnormality further increases when dealing with mixtures containing higher molecular-weight compounds.

Combination Reservoirs

Field D . . . The particular well that was sampled in this reservoir produces from the oil zone and also a gas cap. There had been no appreciable reservoir-pressure decline at the time of sampling, and the subsurface conditions were 4,697 psi. and 239° F. The surface gas-oil ratio was 4,728 cu. ft. per barrel.

Fig. 9 shows the liquid volume behavior of six mixtures of oil and gas at 239° F. The well effluent under reservoir conditions exists as two phases, the liquid phase being 27 per cent of the volume of the system. This infor-

TABLE 1—CRITICAL PROPERTIES AND COMPOSITION OF TEN MIXTURES FROM SIX FIELDS

	Field A		Field B			Field C		Field D	Field E	Field F
Critical pressure, psia.	5,130	5,350	6,000	5,820	5,620	2,720	2,270	5,100	5,570	5,150
Critical temp'tures °F.	285	251	100	160	212	195	0*	239	145	243
Gas-oil ratio, cu. ft. of surface gas per bbl. of stock-tank oil	3,800	3,925	5,450	5,150	4,325	4,000	23,289	3,285	3,225	3,790
MOL FRACTION										
Methane	.7243	.7292	.8227	.8165	.7959	.6433	.8213	.6865	.6570	.7164
Ethane	.0557	.0556	.0284	.0284	.0281	.0638	.0637	.0603	.0869	.0548
Propane	.0308	.0306	.0124	.0124	.0128	.0605	.0409	.0232	.0537	.0310
Isobutane	.0108	.0106	.0036	.0037	.0038	.0107	.0050	.0089	.0038	.0102
n-Butane	.0133	.0120	.0055	.0055	.0060	.0458	.0185	.0220	.0265	.0156
Isopentane	.0080	.0078	.0040	.0042	.0047	.0189	.0055	.0130	.0068	.0133
n-Pentane	.0070	.0069	.0027	.0028	.0031	.0215	.0067	.0113	.0127	.0083
Hexanes	.0179	.0183	.0125	.0131	.0150	.0366	.0103	.0256	.0173	.0198
Heptanes and heavier	.1256	.1223	.1021	.1073	.1247	.0954	.0234	.1245	.1217	.1231
Carbon dioxide	.0066	.0067	.0061	.0061	.0059	.0035	.0047	.0156	.0008	.0075
Nitrogen									.0128	
PROPERTIES OF THE HEPTANES AND HEAVIER FRACTION										
Gravity, °A.P.I.	42.6			45.4		53.4		45.0	39.5	42.8
Molecular weight	167			158		114		171	207	167

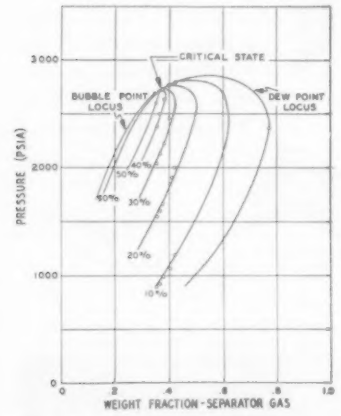


Fig. 8—Field C: Pressure composition at 195° C.

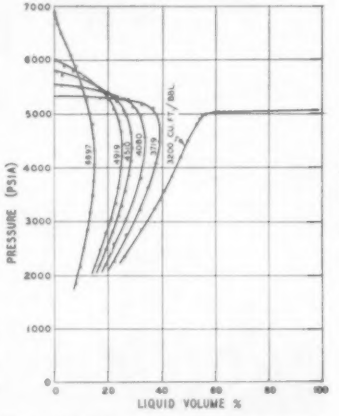


Fig. 9—Field D: Per cent of volume occupied by the oil phase for six mixtures at 239° F.

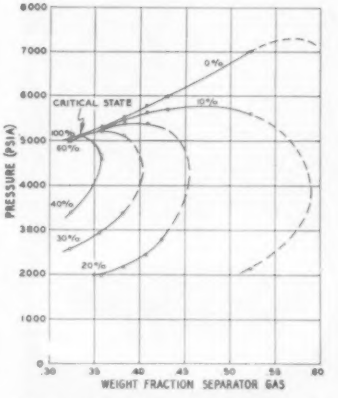
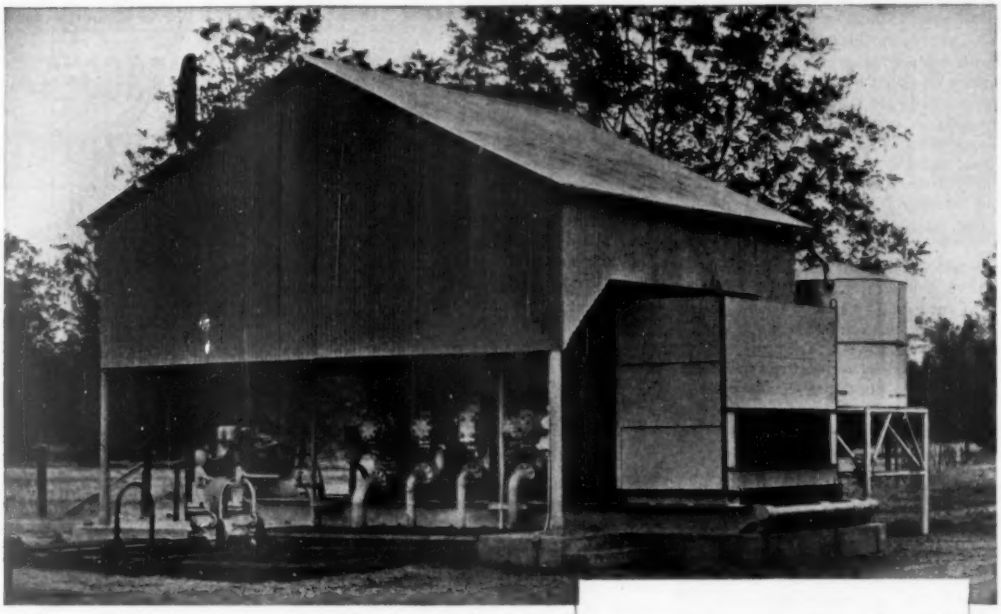


Fig. 10—Field D: Pressure-composition diagram at 239° F.

field gas pressures falling?



Clark has the answer...

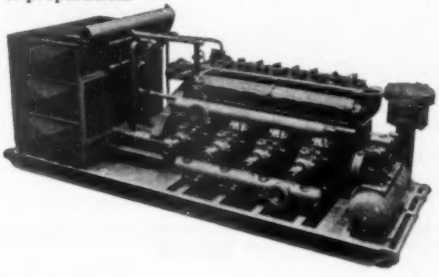
Are you confronted with the problem of field gas pressures falling faster than anticipated? Do you have inadequate compressor horsepower in existing field gathering stations to cope with these conditions?

The obvious answer, of course, is to add more horsepower. Where and how to install it with the least possible disruption of existing plant facilities is an additional problem. The most economical location, not only from the standpoint of reduced pipe size and consequently reduced cost, but also with overall horsepower requirements in mind, is at the point of highest suction pressure or at the well. The simplest, most practical field compressor suited to this use is the Clark Midget Angle.

Factory "packaged" into a complete semi-portable compressor station, it is all set to go to work the day it is received. It has the stamina and ruggedness — the Clark quality and dependability backed by over 600 field installations, to "take over" the job completely with a minimum of preparation.

"Midget Angles"

- **Perfect balance virtually eliminates foundation. A simple concrete slab is sufficient.**
- **Needs only a roof in most cases.**
- **Ready to tie in the day it arrives. It's "factory packaged".**
- **Because it's so rugged, very little attention is required. One man can handle a number of units.**
- **Does not interfere with present compressor station facilities.**
- **Easily trucked over lease roads and bridges without disassembly. It's small and compact.**



CLARK® compressors

CLARK BROS. CO. • OLEAN, N. Y.
Division of Dresser Operations, Inc.
OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
Gas-Engine-Driven • Steam-Engine-Driven
Motor-Driven • Centrifugal • Axial Flow

mation proves that the well effluent was composed of both gas phase and black-oil column hydrocarbons.

The experimental results show that with certain quantities of gas, a dark green oil could be vaporized at 239° F. over a pressure range of 5,200 to 6,850 psi. It is possible that a very small quantity of material may have remained as a liquid or solid, but this could only have been traces that were too small to measure.

A pressure-composition diagram at 239° F. is depicted by Fig. 10. Again, an abnormality in the phase boundary curve is noted. Only one bubble point was measured, which prevented establishing the characteristics of the bubble-point locus. However, the portion of the phase boundary curve that was established has a curvature that is opposite from the same curves for the more simple mixtures.

Information now points to the possibility of having in subterranean reservoirs much heavier, higher molecular-weight compounds than have been previously reported, existing not as a liquid but in the gaseous state.

One other critical state was established for a combination reservoir (Field F) and its properties are listed in Table 1.

A Black-Oil Reservoir

Field E . . . A P-V-T study was made on surface samples from a well producing from the Bromide formation in Oklahoma. This geologic formation is the same as that from which the previously mentioned subsurface sample was obtained.[6] Some of the properties of the produced fluids from each field are shown in Table 2. The stock-tank liquid from Field E has a dark color with a predominant green cast.

The well in Field E was producing excess gas, since only 1,380 cu. ft. of surface gas was required to saturate a barrel of oil at reservoir conditions. The composition shown by Table 2 was computed on the basis of a gas-oil ratio of 2,588, the same as the production from Lindsay field. This composition compares favorably with the subsurface sample from Lindsay field. The bubble point of this mixture would be 5,100 psi. at 145° F. as compared to 4,730 psi. at 189° F. for the subsurface sample from Lindsay field. Obviously, the fluids for the two systems are similar in many respects.

Fig. 11 shows pressure-volume relations at 145° F. for seven mixtures of separator gas and liquid. The liquid-volume curve for the 3,200-cu. ft. per barrel mixture exhibits the same reversal that has been previously observed for a gas-condensate system.

Fig. 12 depicts the behavior of the liquid phase for nine mixtures at 145° F. Gas-oil ratios of 3,800 cu. ft. per barrel and upward exhibited dew points. There appeared to be traces of solid materials that failed to vaporize. However, the relative quantity of unvaporized compounds was extremely small. The absolute liquid - volume values for the 3,800-cu. ft. per barrel mixture decreased continuously with increasing pressure throughout the entire range; whereas the absolute liquid volume of the 3,200-cu. ft. per barrel mixture varied directly with pressure (with the exception of the region of reversal).

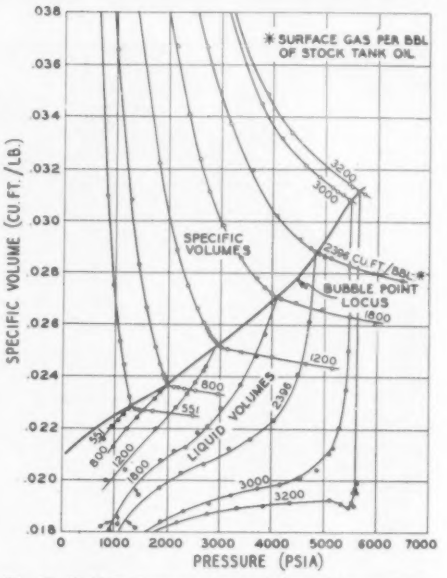


Fig. 11—Field E: Pressure-volume relations of seven mixtures of oil and gas at 145° F.

Fig. 13 is a pressure - composition diagram at 145° F. Discontinuity at the critical state is more pronounced for this system than for those previously studied. It would be expected that such phenomena would be more apparent for a system that contained black oil, inasmuch as the differences in properties of the lightest and heaviest constitutents for this system would be greater than for a gas condensate. Complexity increases also, because of the presence of more chemical compounds.

The P-V-T study of a subsurface sample of "black oil" from Lindsay field,[6] predicted that ". . . if gas at the correct composition were added to and absorbed by the reservoir oil through increased pressure and agitation, when the saturation pressure of the reservoir oil reached 5,200 psi. the density of the gas and oil would be

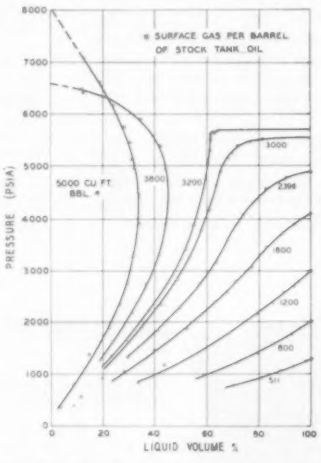


Fig. 12—Field E: Liquid phase behavior of nine mixtures of separator gas and liquid at 145° F.

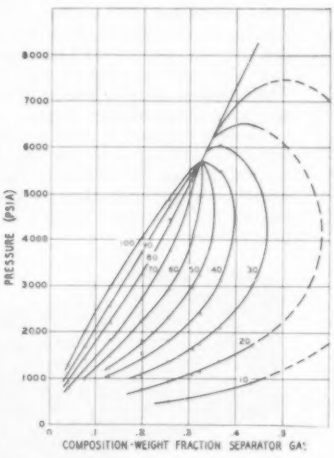


Fig. 13—Field E: Pressure-composition diagram at 145° F.

WHY ARE MORE BRISTOL RECORDING GAUGES BEING USED THAN ALL OTHERS COMBINED?

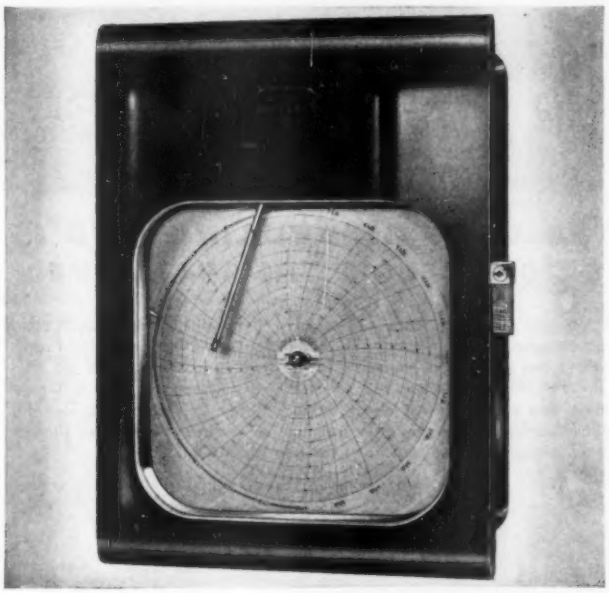
The heart of the pressure gauge is the pressure measuring element.

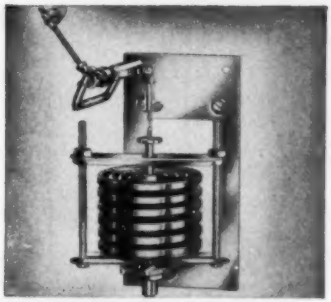
Hundreds of thousands of Bristol recording gauges in use all over the world, operating under all kinds of conditions, testify to the high accuracy, long life, and permanent calibration of Bristol's element.

Many Bristol gauges have been in constant service for 20, 30 and 40 years!

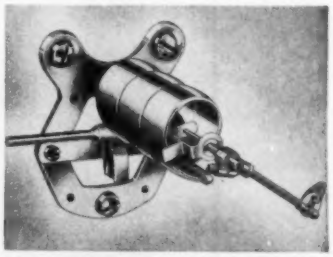
Now Bristol presents its *new* line of Series 500 recording pressure gauges in ranges from 0 to 6 millimeters mercury absolute to 0 to 10,000 psi. They have many outstanding new features which make them easier to use, convenient to service, readily convertible. And they incorporate the three most advanced designs of measuring elements.

Models are available for recording, automatic controlling, pneumatic transmission and telemetering. Immediate delivery on many ranges. Write for new 32-page Catalog G621. THE BRISTOL COMPANY, 120 Bristol Road, Waterbury 20, Conn.

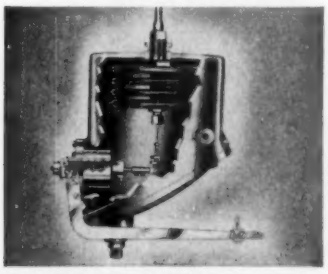




FOR LOW PRESSURE RANGES—new Type E measuring element is used for ranges from 0-2 in. water to 0-29.9 psi pressure or vacuum. Extremely high torque gives positive pen positioning across entire range. Highly accurate, extremely stable. 250% inherent over-range protection.



FOR INTERMEDIATE AND HIGH RANGES—new helical measuring element is for ranges from 0-30 psi to 0-10,000 psi. Special nonferrous alloy—heat-treated to withstand impact of rapid fluctuations—gives permanent accuracy over a long period of service life.



FOR ABSOLUTE PRESSURE—new single-bellows type element measures ranges as low as 0-6 mm. mercury absolute and gives direct reading of pressure above absolute zero inherently corrected for barometric variations—with far greater accuracy than ever before.

THE DEPENDABLE GUIDEPOST OF INDUSTRY

BRISTOL

SINCE 1941 the average total drilling cost has increased more than 60%

YET THE COST OF DRILLING MUD IS STILL 20% BELOW THE 1941 LEVEL

Along with fair and reasonable prices, Magcobar has helped bring about other important advantages to the oil industry. Better service is an example. Today, Magcobar alone has more mud engineers in the field than the total of all mud companies in 1941. And, Magcobar has continually expanded and kept its service organization in tune with the needs of the industry. When you need mud, look for the "Magcobar, complete drilling mud service" sign in your area. Magcobar Dealers are ready to serve you night and day from Canada to the Gulf Coast.

Magcobar
Complete
DRILLING MUD SERVICE
DEALER

Magcobar • Magcogel • High Yield • Magco-Fiber • Xact Clay • Fiber Seal • Leather-Floc • Farm-A-Plug • Cell-O-Seal Salt Gel • Magco-Phos • Red Ox • Magco-Mica • Tannathin Jel-Oil Mud • Jel-Oil "E" • "E" Concentrate • Noheev My-Lo-Jel Preservative • Quebracho • Chemicals

DRILLING MUD COST PER TON
AVERAGE COST OF MUD
MAGCOBAR ENTERED THE PICTURE HERE
FAIR AND REASONABLE MUD PRICES
AND TEN YEARS LATER . . . THE COST IS STILL 20% BELOW THE 1941 AVERAGE BEFORE MAGCOBAR
1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951

MAGNET COVE BARIUM CORP • MALVERN, ARK • HOUSTON, TEXAS

ONE OF THE DRESSER INDUSTRIES

TABLE 2—SOME PROPERTIES OF THE FLUIDS FROM TWO BROMIDE FORMATION (OKLAHOMA) FIELDS

	Lindsay Field	Field E
Date of well completion	10-20-46	2-16-49
Static reservoir pressure, psia.	4,879	3,232
Reservoir depth (subsea), ft.	9,900	6,558
Original pressure, psia.	4,925	3,334
Reservoir temperature, °F.	189	145
Separator pressure, psia.	61	225
Separator temperature, °F.	60	40
Gas-oil ratio (separator gas/stock-tank oil)	2,588	2,649
Gravity of stock-tank oil, °A.P.I.	47.1	45.7

	Compositions (mol fraction)	
	Subsurface sample	Recombined sample*
Methane	.6206	.6458
Ethane	.0950	.0870
Propane	.0619	.0556
Isobutane	.0128	.0041
n-Butane	.0254	.0286
Isopentane	.0098	.0075
n-Pentane	.0139	.0141
Hexanes	.0226	.0193
Heptanes and heavier	.1310†	.1360‡
Carbon dioxide	.0028	.0007
Nitrogen	.0042	.0013

*Equivalent to a 2,588 cu. ft. separator gas per barrel stock-tank oil mixture. †Molecular weight = 180. ‡Molecular weight = 207.

identical and the mixture would be at the critical pressure." The data shown by Figs. 12 and 13 prove that this prediction of the possible vaporization of black oil can occur at 5,700 psi. for a 3,400-cu. ft. per barrel mixture of the system that was studied.

Acknowledgment

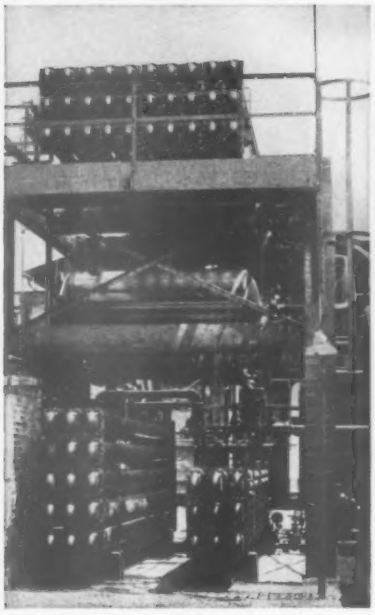
The author would like to express his appreciation to The Texas Co. for permission to publish the data; to G. Herzog and K. C. ten Brink for their assistance in the preparation of the manuscript; and to W. H. Boze, G. L. Haferkamp, and W. B. James for their assistance in obtaining the experimental data.

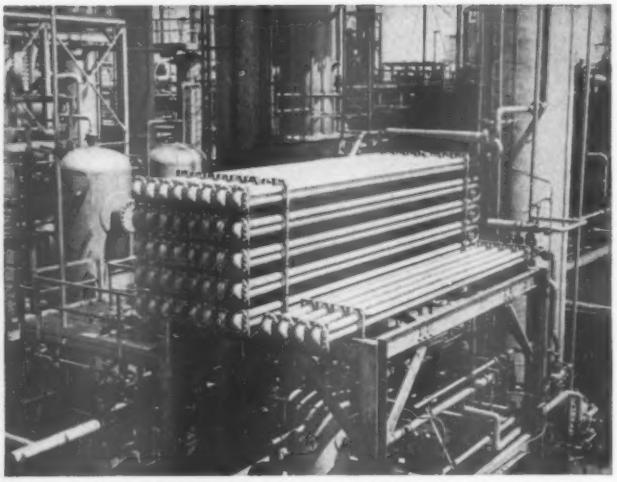
References

1. Foran, E. V., A.P.I. Bull. 210, 61 (1932).
2. Lacy, W. N., A.P.I. Bull. 210, 65 (1932).
3. Stephenson, E. A., A.I.M.E., Reprinted Transactions Vols. 127 and 132, p. 249, (1938-39).
4. Thornton, O. F., A.P.I. Drilling and Production Practice, 150 (1946).
5. Sloan, J. P., Pet. Eng., Feb. 1950.
6. Cook, A. B., Spencer, G. B., Bobrowski, F. G., and Dewees, E. J., Pet. Eng., 158, Sept. (1948).
7. Eilerts, C. K., Barr, V. L., Mullens, N. B., and Hanna, Betty, Pet. Eng., 19, 154, (1948).
8. Weinaug, C. F., and Bradley, H. B., A.I.M.E. annual meeting, New Orleans, 1950.
9. Katz, D. L., Bulletin No. 114, Texas Engineering Experiment Station.

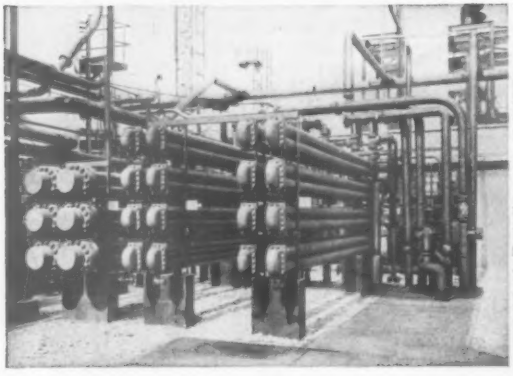
For
RIGGING UP EQUIPMENT . . .
Setting Boilers
Slush Pumps,
Compressors,
Diesel and Gas Engines.
. . . .
Tightening Belts—
Lifting and Lowering Pipe,
Large Valves, Etc.
Use Dependable
DUFF-NORTON
JACKS
Big jacks . . . small jacks . . . jacks with lifting capacities ranging from 3 to 100 tons . . . all are available from the Duff-Norton complete line of jacks for every lifting and lowering requirement in the oil industry.
No. 25-H-9.3
Hydraulic Jack
The jacks illustrated are hydraulically operated for use in low height areas. The 25-H-9.3 is 9⅜" high with a lifting capacity of 25 tons. The 30-H-4.5 is only 4½" high and will lift 30 tons. For more data on these and other time and effort saving jacks . . .
WRITE FOR
HYDRAULIC JACK
BULLETIN AD-16-U
No. 30-H-4.5
Lo-Hite Hydraulic
Jack with
independent pump
STRENGTH SAFETY DURABILITY
DUFF-NORTON
JACKS
ESTABLISHED 1883
THE DUFF-NORTON MANUFACTURING CO.
MAIN PLANT and GENERAL OFFICES, PITTSBURGH 30, PA.—CANADIAN PLANT, TORONTO 6, ONT.
"The House that Jacks Built"

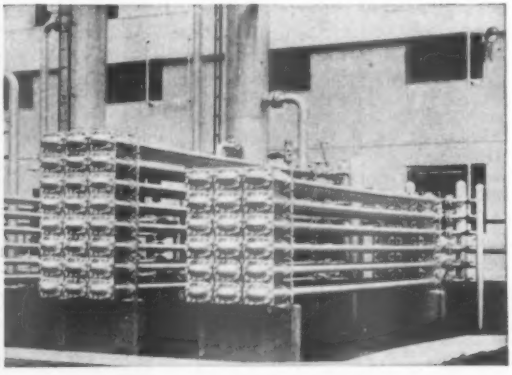
HEAT EXCHANGERS





Notice the flexibility in installed arrangement of G-R Twin G-Fin Sections as shown by the illustrations. Many concerns are using several hundreds of Twin G-Fin Sections on heat transfer duties all over the plant because of their unequalled adaptability to a wide range of service requirements.





GRISCOM-RUSSELL: PIONEERS IN HEAT TRANSFER APPARATUS

you can take "off the shelf"

Have you ever thought how convenient it would be to be able to "stock" heat exchangers . . . just as you do with valves, fittings and bolts . . . so as to have them ready as quickly as you need them for heat transfer services?

You can do it with the G-R Twin G-Fin Section . . . the multi-purpose heat exchanger. These units can be set up in stacks just like a sectional book-case. They can be grouped in parallel or series for complete flexibility of capacity and temperature range. You can use them for practically any condensing, cooling, heating or heat exchange service. They are easily and quickly transported and piped up.

When you need a new heat exchanger, just write, phone or wire us to ask the Twin G-Fin Section set-up that will do the job. If the service conditions of an existing Twin G-Fin Section installation are changed, it's a simple matter to add or remove one or more sections. And if an existing installation is no longer needed because of process changes, the units can be disconnected and returned to the storeroom for "stock", to be held until the next call for heat exchangers.

Many plants are already doing this. These plants need not wait for specially designed and manufactured heat exchangers for most of their services, nor do they have to pay the cost of "tailor made" units.

Just think of the advantages for your own plant . . . and write us for full information.

ADVANTAGES OF THE

G-R TWIN G-FIN SECTION

1. SIMPLE . . . just the patented G-Fin pipe within a shell. The patented stationary head closure has only 3 parts.

2. EFFECTIVE . . . the famous longitudinal G-Fins have 6 to 11 times as much external heat transfer surface as bare tubes, requiring less surface for a given duty.

3. STURDY . . . designed for pressures up to 1800 psig. The heat transfer elements are pipes of standard thickness, not thin gauge tubes.

4. DURABLE . . . proven by the operating results of more than 50,000 installed units, some of which have been in service for as long as 15 years.

5. CONVENIENT . . . easily transported . . . easily installed . . . easily maintained.

6. ADAPTABLE . . . G-Fin elements and fins can be made of any ferrous or non-ferrous alloy regularly used in heat exchanger service.

THE GRISCOM-RUSSELL CO., MASSILLON, OHIO

GRISCOM-RUSSELL

GR-250

BOOKS

THIRD ANNUAL INSTITUTE ON OIL AND GAS LAW AND TAXATION, of the Southwestern Legal Foundation. Published by Matthew Bender & Co., Albany, N. Y. 488 pp. $18.50.

Important present-day problems of the oil and gas industry are discussed by a distinguished group of lawyers who are authorities on specific phases of oil and gas law and taxation as affecting the oil and gas industry. These articles form the basis for the several lectures delivered during the 3-day session of the third annual institute on oil and gas law presented in cooperation with the S.M.U. School of Law, Dallas, January 17-19, 1952. The articles printed here have been expanded beyond their original lecture form and enjoy the advantage of footnote citations and other helpful addenda.

A.S.T.M. SPECIFICATIONS FOR STEEL PIPING MATERIALS. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3. 384 pp. $3.50.

The 1952 edition of this compilation sponsored by A.S.T.M. Committee A-1 on Steel contains in their latest approved form (as of late February) the 56 widely used A.S.T.M. specifications for carbon-steel and alloy-steel pipe and tubing, including stainless. Materials covered include: pipe used to convey liquids, vapors, and gases at normal and elevated temperatures; still tubes for refinery service; heat-exchanger and condenser tubes; boiler, superheater, and miscellaneous tubes. To make the volume more complete there are also included specifications for the following materials used in pipe and related installations: castings; forgings and welding fittings; bolts and nuts. The A.S.T.M. standard classification of austenite grain size in steels (E 19) with two sets of charts; also the American Standards covering wrought steel and iron pipe (B36.10) and stainless steel pipe (B36.19) are a part of the book.

THE OIL-PRODUCING INDUSTRY IN YOUR STATE. Published by Independent Petroleum Association of America, Tulsa.

This is the 1952 edition of this statistical reference work on oil and gas production in 27 states. Last published in 1950, the book has been doubled in size by use of additional information and comparative charts on petroleum reserves, production, drilling, and economic value in each producing state. With four illustrated pages on each state, the book contains information on the geological extent and economic contributions of the petroleum industry from the date of the first recorded production up to January 1, 1952.

STANDARD RULES FOR FIELD WELDING OF STEEL STORAGE TANKS. Published by American Welding Society, 33 West Thirty-ninth Street, New York 18. 23 pp. 50 cents.

This standard for the first time now includes provisions for the use of automatic welding in the fabrication of storage tanks for storing liquids at not over 15 psig. The existing rules have been revised to cover the qualification of welding procedures and welding operators for automatic welding and related requirements throughout.

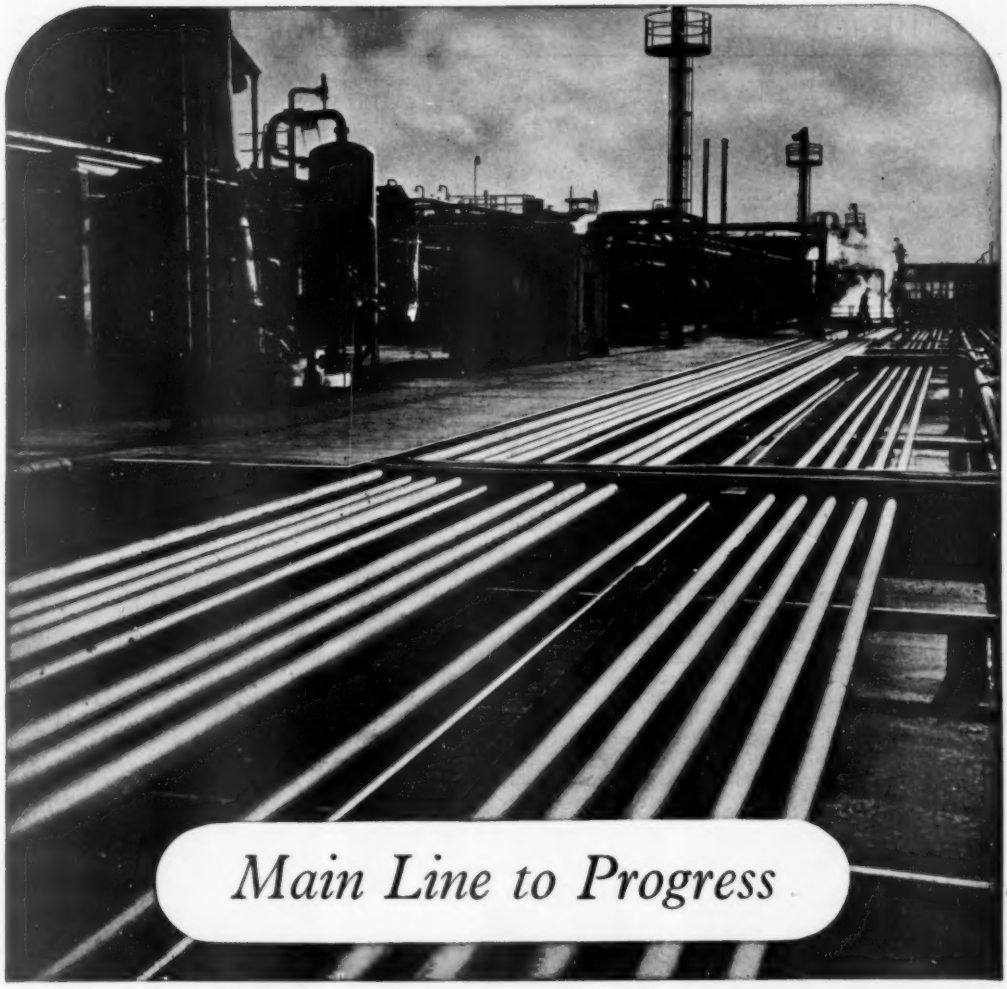
ECONOMICS OF AMERICAN MANUFACTURING. By Edward L. Allen. Published by Henry Holt & Co., 383 Madison Avenue, New York 17. 566 pp. $6.95.

In this book, 19 representative industries are examined within 5 general categories: basic metal, basic nonmetallic, metal working, textile and allied, and consumer specialty. Following an introductory chapter on the place of manufacturing in the American economy, the author analyzes each industry from three standpoints: its setting in the national economy; structure of the industry; and financial factors. A concluding chapter is devoted to sources of industry data and an extensive bibliography. The petroleum industry is considered in Chapter 5 which begins with an introduction and then considers its relative size and importance, use pattern of its products, its export-import relationships, relation with state and federal governments, corporate ownership and control, location, technology, prices, profits, and future outlook. As for the last-named, the short-range outlook is considered very bright, but that the long-range outlook is clouded by the reserves picture.

MINERAL FORECAST 2000 A.D. By Edward Steidle. Published by Pennsylvania State College, State College, Pa. 216 pp.

This book is in two parts, Minerals and Posterity, and Mineral Forecast 2000 A.D., the two parts being Circulars 37 and 39 of the college. The need for Circular 37 presented itself when the nation entered the Korean War. It seemed desirable to review our utter dependence on outside sources for many strategic and critical mineral supplies during World War II, together with the necessity for down-to-earth mineral policies. The intent of Circular 39 is to show how education and research can constantly point out new directions of effort and prove that what we lack in quality resources can be offset by better brains and skills.

ARCCO
ARCCO-ANUBIS
RECORDING CONTROLLING*
LIQUID GRAVITOMETER
CONTROLS BLENDING OF TWO OR MORE FINISHED PRODUCTS
. . . for Pipelines, Refineries, Chemical Plants, etc.
This new instrument serves to determine and record the specific gravity of liquids in the same manner as the standard Arcco-Anubis liquid gravitometer.
*In addition to these features, a controlling mechanism is provided, which may be pre-set to operate the pipe line, refinery, still and plant control valves to any specific gravity range required in blending two or more finished products.
Temperature corrected, this extremely accurate instrument is adaptable to high pressures and is available with internal parts of stainless steel for use with corrosive liquids. Send for bulletin No. 111 A.
AMERICAN
RECORDING CHART CO.
2133 E. 11th St. • Los Angeles 23, Calif.
Available for Early Delivery
SEND FOR BULLETIN No. 111-A



Main Line to Progress

THE traffic on these lines is non-stop, night and day—for these are oil lines in one of the four Anglo-Iranian refineries in the United Kingdom.

By 1953, these four refineries will be producing at the rate of over 200,000 barrels of petroleum products a day, which will be the largest single contribution to the United Kingdom's total refinery throughput.

Overseas, throughput in the group's eight other refineries is also being steadily and considerably increased, and plans are now progressing for the construction at Fremantle of another new refinery, which will be the largest in Australia.

For new sources of this vital mineral Anglo-Iranian is prospecting in the U.K. itself, and in such varied regions as Nigeria, Sicily and Papua.

THE BP SHIELD IS THE SYMBOL OF BP THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company LIMITED

REPRESENTATIVE IN U.S.A.: W. D. HEATH EVES, 610 FIFTH AVENUE, NEW YORK 20, N.Y.

1 Film begins with slide showing Elmer McGant, maintenance boss, being plagued with service calls from points throughout plant.

2 McGant gets all kinds of complaints. One worker says he's all fouled up because someone painted a pump gray instead of green.

3 Tom Jones, another maintenance boss, manages to run things very smoothly. He says pumps should be set up right, given good care.

Good pumps deserve good care, so . . .

Allis-Chalmers' new strip film, "Pump Maintenance," tells you how to go about it and avoid mistakes, and headaches

THE performance you expect to get out of your pump depends in most all instances on two important factors:

1. The pump must be installed correctly in the right place, and under the right circumstances.

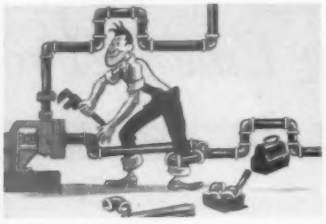
2. The pump must get the kind of maintenance which will do it justice, and give it a chance to live up to its reputation as a good worker.

To help employes visualize the importance of proper installation and maintenance of pumps for industry, Allis-Chalmers Manufacturing Co., Milwaukee, has produced a strip film entitled "Pump Maintenance," which points out the many mistakes made by maintenance men in installing and caring for this type machine.

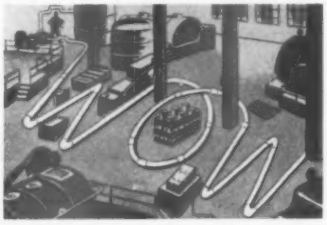
The conclusion is that if the job is done right, then a pump will give maximum performance with a minimum of attention.

The pump film, 39 "shots" of which appear on these pages, was produced under the direction of John Gammell, supervisor of sales training for the company. The entire "show" is available from the company to groups for training purposes.

4 One point Tom knows is: Never to open the priming petcock while a pump is operating. This he learned the hard way! Never again!

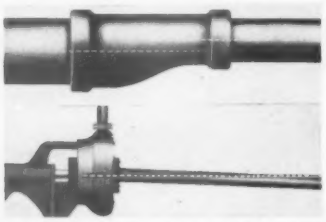


5 Piping jobs aren't easy; sometimes you have to go around things. But you can overdo this, too, and complicate things even more.

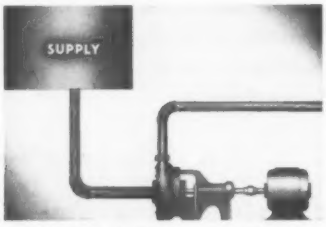


6 Piping may look like this before you're through if you're not careful in what you're doing, Tom warns. Simple piping is best.

7 Use just as few bends as you can get by with and you won't have any trouble. Keeping piping simple makes for easier, better care.

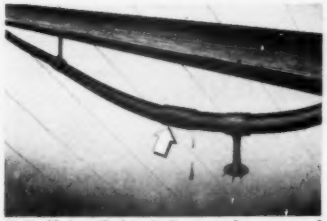


8 Keep all suction piping sloping down from pump when it is above supply. By sloping toward supply air won't be trapped in pipe.



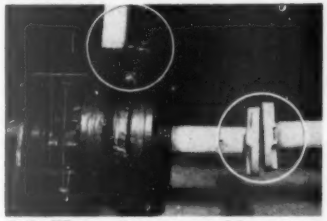
9 If pump is installed below supply source you won't lose prime providing there isn't any inverted "U" piping or other traps.

10 Use good and sufficient pipe dope on each joint and then make up the joint well. If suction line isn't tight pump efficiency drops.



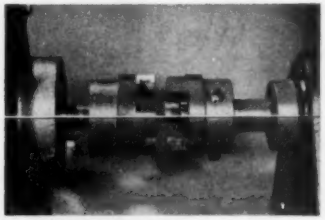
11 If installation isn't properly supported joints may not stay tight. Weak supports sometimes give way, letting the pipe sag out of line.

12 Always adjust flow on discharge-line side of pumps; regulating valves should be on this side. Then supply can't be cut off.

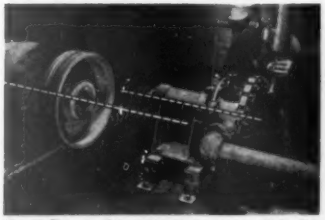


13 When ready to connect piping to pump make sure the pipe flange and pump flange halves are in line. Do not force them, Tom warns.

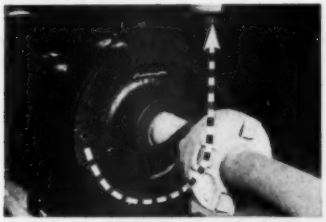
14 Out-of-line piping causes pump casing to be sprung. This lets closely fitted parts rub, scrape, can throw shaft, bearings out of line.



15 Mount pump, motor on same base plate. If impossible, use a flexible coupling, then bolt down the two so they'll stay in line.

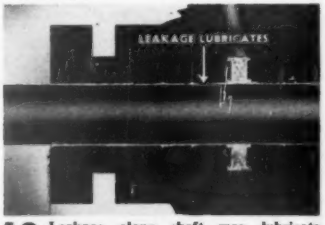


16 Reasonable alignment is needed between sheaves. Belts can handle only slight misalignment without excessive wear of pump parts.

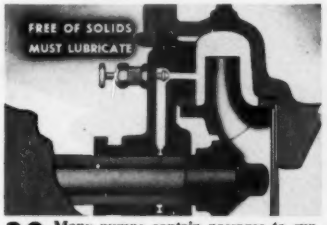


17 Be sure pump runs in right direction. (Some flow occurs when running backwards.) Check instructions to see which way shaft should turn.

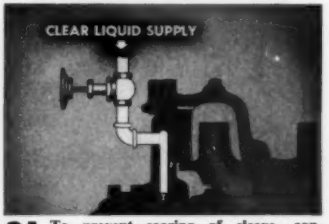
18 If packing in stuffingbox runs dry it will burn up and shaft sleeve will score. Be sure to check packing and lubricate it regularly.



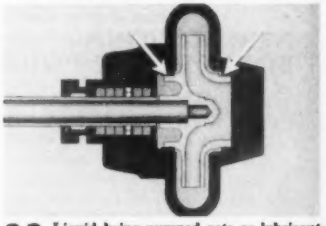
19 Leakage along shaft may lubricate packing. This is not good practice for pumping hydrocarbons. Make other provisions for good lubrication.



20 Many pumps contain passages to supply packing with liquid under pressure. Needle-valve control prevents over-supplying packing.



21 To prevent scoring of sleeve, connect clean liquid supply from some external source to stuffingbox. Be sure to use right liquid.



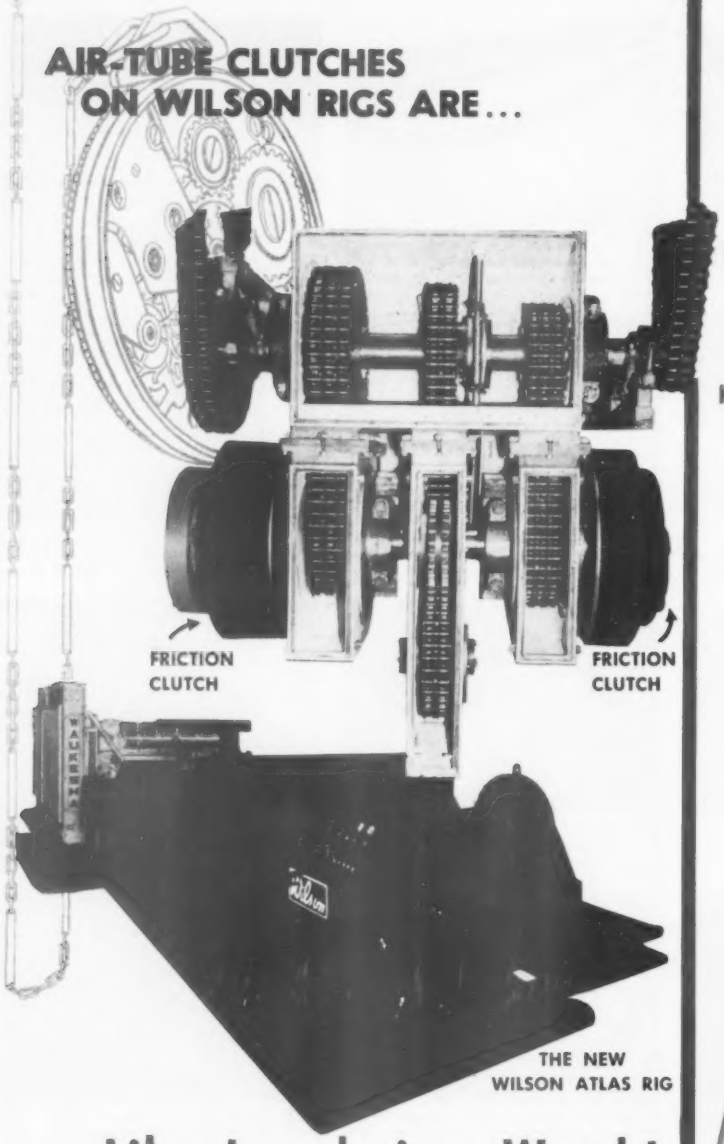
22 Liquid being pumped acts as lubricant between closely fitted pump parts such as impeller and wearing rings, Tom points out.

23 If packing gland leaks too much, gradually tighten. If tightening does not stop bad leakage, then its replacement is usually needed.

24 When ordinary tightening of packing gland doesn't keep leakage down, replace it. Don't wreck an expensive pump with a "cheater."

Please turn the page . . .

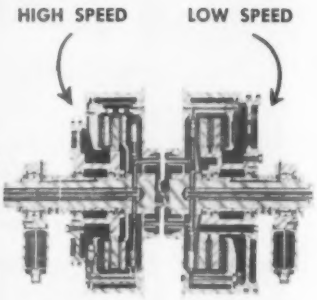
AIR-TUBE CLUTCHES ON WILSON RIGS ARE...



...Like Jewels in a Watch!

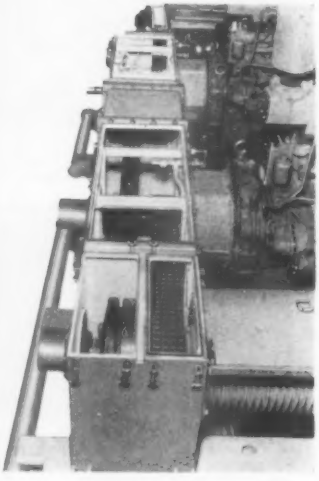
Thirteen Clutches throughout this 2-engine rig and every one an Air-Tube Disc Clutch. Wilson rigs are made *more flexible through the use of these clutches* on *all drives. They offer to the operator a trouble-free rig* and—like jewels are in a watch—Air Friction *clutches make Wilson rigs smoother running and longer lasting.*

Compare FEATURES — QUALITY — COSTS



HIGH and LOW SPEED DRUM CLUTCHES

Clutches within the drum are very important. Drums on Wilson Rigs have both a high speed and low speed Air-Tube Disc Clutch, affording faster, more efficient operation, fewer moving parts, with absolutely no adjustment.



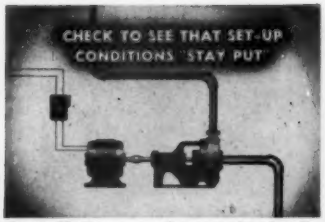
NEW SECTIONAL BOX-TYPE COMPOUND

Air-Tube Clutches in the Wilson Sectional Box-Type compound makes flexible couplings obsolete, and adds to efficiency of rig. Greater horsepower to transmission is assured.

Wilson MANUFACTURING CO., Inc.

WICHITA FALLS, TEXAS

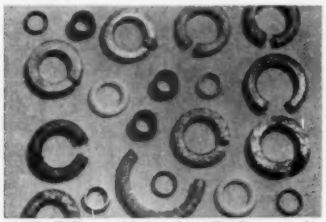
25 Keep a card-index record on each pump to determine when a pump needs attention, and the different servicing problems involved on each.



26 Check to see that pumping installation "stays put." Perfect alignment is absolutely necessary to get best service out of pumps.

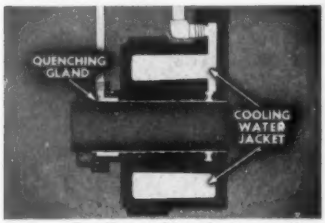
27 Lubricate bearings with the right kind of grease or oil. Remember that different types of pumps have different kinds of bearings.

28 Use the right kind of lubricant, too. That's important because different kinds of bearings require different types of oil, service.

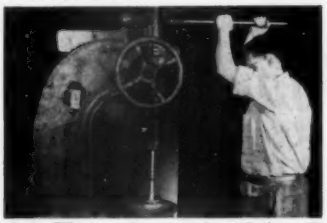


29 Different kinds of applications require different kinds of packing. Kind of packing depends on temperature, kind of liquid you pump.

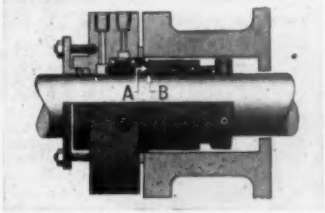
30 Stuffingboxes can run too hot. This depends on location and service of the pump. Keep a close watch on it, check packing often . . .



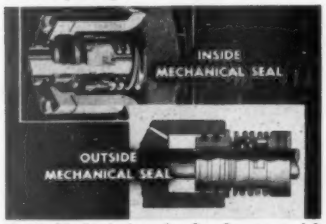
31 . . . Install quenching gland or cooling-water jacket to cut down on temperature. Circulation of coolant reduces temperature of packing.



32 When a sleeve needs replacing, (1) tear down pump, (2) pull shaft, (3) remove old sleeve in arbor press, (4) then press on new one.



33 Mechanical seals are used in many pumping jobs such as pumping of alcohol, butane, gasoline, naphtha, acids—even crude oil or water.



34 Mechanical seals do the same job that packing does. These seals also lower maintenance costs. They can be original or replacements.

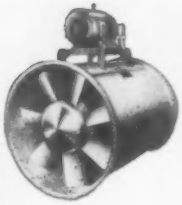
35 If pump's efficiency falls off you'd better replace wearing ring or rings pronto (there's no set rule for replacement). And . . .

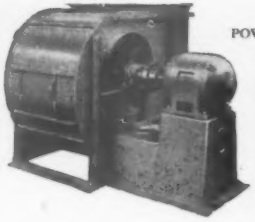
36 . . . It's not such a job. On casing wearing ring, just heat pump casing around ring. Heat expands casing, ring slips out. Or . . .

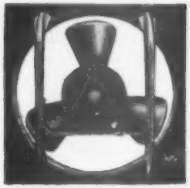
37 . . . The ring can be shrunk by packing it in dry ice. Either way is satisfactory to install a new ring. Both save time and trouble.

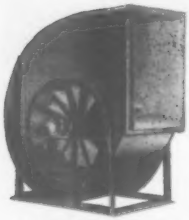
38 If an impeller is pitted like this one, then there probably has been cavitation. This is caused by running the pump too fast.

39 Now, after checking Items 3 through 38, McGant is "out of the dumps." He's followed Tom's tips on how to care for centrifugal pumps!


AXIAL FLOW FANS


POWER PLANT FANS


BREEZO FANS


LIMIT-LOAD FANS

75 years of building dependable air handling equipment

VOLUME FANS

TYPE "CB" PRESSURE BLOWERS

BELTED VENT SETS

TYPE "CC" PRESSURE BLOWER

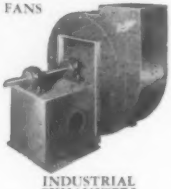
RE BLOWERS-EXHAUSTERS

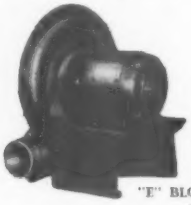
Efficient Air Handling Units
To Satisfied Customers
Since 1877

We welcome the opportunity to solve *your* problem.

BABY CONOIDAL FANS

BELT AIR FANS


INDUSTRIAL EXHAUSTERS


"E" BLOWERS-EXHAUSTERS

SHORTBOY VENTILATING SETS

FIRST FOR FANS

"Buffalo" BUFFALO FORGE COMPANY

525 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

DIAMOND JUBILEE 75 1900 ANNIVERSARY

VENTILATING | PRESSURE BLOWING | AIR CLEANING | COOLING | AIR TEMPERING | HEATING | INDUCED DRAFT | FORCED DRAFT | EXHAUSTING

QUESTIONS ON TECHNOLOGY

by W. L. Nelson
Technical Editor

What Are Sour Crude Oils?

"I have not been with the industry long and I am confused about what is meant by 'sour' crude oil. Some writers speak of sour crude oils as if the term means 'high sulfur,' and so what is the difference?" R.S.P.

The term "sour" is used by practical petroleum men such as technologists, [1 2 3] oil-field producers, [4 5] pipe-line operators, [6 7] storage terminal operators, [8 6 6 9 10 11 12] crude-oil producers, [4 7 9 13] and refinery operators, [6 10 14] to mean that the crude oil contains dissolved hydrogen sulfide. Such crude oils are dangerous in field tanks, storage tanks, and in product rundown tanks in refineries because even 0.1 per cent hydrogen sulfide in the gas above the crude oil or distillate products will cause death within 30 minutes. [10] Such crude oils are also highly corrosive at the wells and tanks in the field, in pipe lines at storage terminals or tank farms, and in the topping plant part of a refinery. The sulfide scale produced in tanks, lines, heat-exchanger bundles, vessels, etc., sometimes spontaneously ignites upon exposure to air and hence it is a potential source of fires or explosions. [10] Mercaptan sulfur compounds are also present in relatively large amounts (usually 10-15 times as much as in "sweet" crude oils), [15] and these along with hydrogen sulfide cause the gasoline from sour crude oils to have a poor susceptibility to tetraethyl lead. One to one and one-half extra cubic centimeters of tetraethyl lead fluid [20] is required to overcome the poor lead susceptibility of the gasolines from sour crude oils (even after they have been sweetened).

This usage of the term sour is evident in the following quotations:

"Sour oil contains hydrogen sulfide and some water and thus combine to form an acid that eats away the pipe." (Interstate Pipe Line Co.). [7]

"Sour crude oils, which are those containing hydrogen sulfide and other sulfur compounds . . .", and "Sweet crude oils contain no dissolved hydrogen sulfide and relatively small amounts of mercaptans or other sulfur compounds." (Humble Pipe Line Co.). [8]

"This acid gas (referring to hydrogen sulfide) occurs naturally in many crudes known by this property as sour crudes." [10]

"They (refers to Saudi Arabian crudes) are classified as high-sulfur crudes, but they are not considered sour because they do not contain highly active sulfur compounds." (Universal Oil Products Co.). [11]

"For the purpose of this discussion, sour crudes are defined as those containing, or evolving upon processing, considerable quantities of hydrogen sulfide — H_2S. Crudes of a wide range of sulfur content come under this classification." (The Texas Co.). [12]

"In the broad classification of natural gases we repeatedly encounter the terms . . . and sweet or sour according to the presence or absence of hydrogen sulfide." [13]

"In this connection (referring to whether an oil is sour) the reader should not be confused between "sweetness," i.e., reaction to 'doctor,' and actual sulfur content. An oil may be low in sulfur percentage and strongly reactive to the 'doctor' solution, the converse being equally possible." [4]

"Of the two processes the former which is termed "sweetening"—untreated distillates contain mercaptans or hydrogen sulfide being referred to as "sour"—is by far the most widely used, desulfurization (meaning the other of the two processes) only being employed when the sulfur content of the sweetened material exceeds specification value." (Anglo Iranian Oil Co.). [19]

"It (meaning the term "sour") is used as a general or generic term to designate those crude oils which contain a sufficient amount (and kind) of sulfur to cause difficulty with sourness of the distillates produced from it by a simple distillation." [20]

References

1. Uhl, Wm. C., "Sulfur in Your Crude Oil? . . . It's Not How Much But Where?", Petroleum Processing, July 1950, p. 729. He reports on the corrosion suffered with supposedly "relatively sweet type" crude oil (only 0.2 per cent sulfur) from West Texas (mostly Ellenburger formation of Ordovician age).

2. Day, David T., "Handbook of the Petroleum Industry," Vol. II, John Wiley & Sons, Inc., N. Y., 1922. Footnote 2 on page 334.

3. Nelson, W. L., "Petroleum Refinery Engineering," McGraw-Hill Book Co., Inc., third edition, 1949, N. Y., pages 193, 257, 258, and 711.

4. Platt's Oil Price Handbook, Platt's Price Service, Inc., Cleveland, 1950. Separate schedules of posted prices are shown for certain "sour" and certain "sweet" crude oils and the index of crude oils lists many sour crude oils.

5. Anon., "Aramco's New Field Has Big Sweet Crude Yield," Oil Forum, May 1949, p. 201.

6. Crane, Geo. L., ". . . Scale Traps in Sour Crude Service," The Oil and Gas Journal, June 10, 1948, p. 92. Interstate Pipe Line Co. encountered severe corrosion in lines, pumps, and tanks in what they call their sour crude system serving Magnolia, Arkansas.

7. Anon., "Inert-gas-welded Aluminum Pipe . . . Carry 'Sour Oil,'" Pet. Engineer, July 1949, p. 45. (Interstate Pipe Line Co.)

8. Pierce, et al, "Processing Sour Crude" The Oil and Gas Journal, Sept. 30, 1946, p. 96. Floating-roof tanks are helpful. (Globe Oil & Ref. Co.)

9. Brannon, R. A., "Internal Corrosion of Crude Oil Tanks," Pet. Engineer reference annual, 1949, p. D-22. This Humble Pipe Line Co. man states the costs of maintaining tanks in sour oil service.

10. Black, R. W., "Gas Freeing Tanks . . . Air Movers vs. Steaming," Pet Refiner, December 1948, p. 139, (Standard Oil Co. of N. J.).

11. Private communication—Chief Safety Engineer, R. W. Black, relates that 0.5 cu. ft. hydrogen sulfide per 100 gal. will cause dangerous iron sulfide deposits by corroding storage tanks.

12. Rogers, W., The Oil and Gas Journal, Vol. 34, No. 23, p. 69 of 1935. He is quoted by L. R. Sheppard (Shell Pipe Line Co., Houston) as associating corrosion with hydrogen sulfide—even 0.1 per cent by weight promoting rapid corrosion.

13. Private communication—One large purchaser of West Texas crude oils states that all of the crude oils are really "sour," even those purchased under the sweet and Fullerton schedules as well as the sour schedule.

14. Esso Standard Oil Co., "Safety Instructions for Preventing Accidents and Personal Injury" (General Safety Committee). Also "Refinery Safety for Technical Personnel."

15. Waite & Aitken, "Problems . . . Refining of Sour Crudes," The Oil and Gas Journal, Aug. 5, 1943, p. 27. (The Texas Co.—Refining Department).

16. Marshall Parker, "How to Combat Corrosion in Processing Oil and Gas," The Oil and Gas Journal, March 15, 1952, p. 240.

17. Egloff, G., "Refining Saudi Arabian Crudes," The Oil and Gas Journal, Dec. 30, 1948, p. 159.

18. National Petroleum Convention—"Utilization of Natural Gas in Venezuela," Part I, Nature and Occurrence, p. 381, Ministerio de Minas e Hidrocarburos, Caracas, Venezuela.

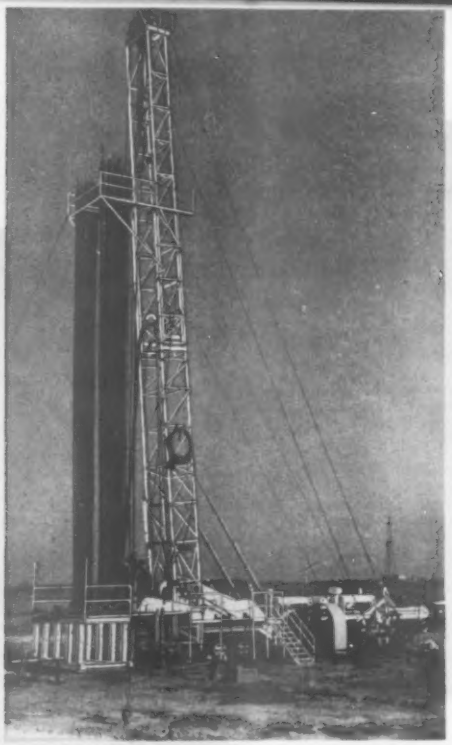
19. Dunstan, et al, "Science of Petroleum," Vol. III, Oxford University Press, 1938. Dr. D. F. Birch of Anglo Iranian Oil Co. on page 1724.

20. Nelson, W. L., "What Are 'Sour' Crude Oils?", The Oil and Gas Journal, Sept. 23, 1943, p. 246.

21. Tait, T., Desulfurization and Sweetening—"Progress in Petroleum Technology," N. Y. meeting of A.C.S., Sept. 1951, p. 151.

22. Nelson, W. L., "Hazards & Corrosion with Sour Crudes," The Oil and Gas Journal, Dec. 16, 1944, p. 107. (Refiner's Notebook No. 22).

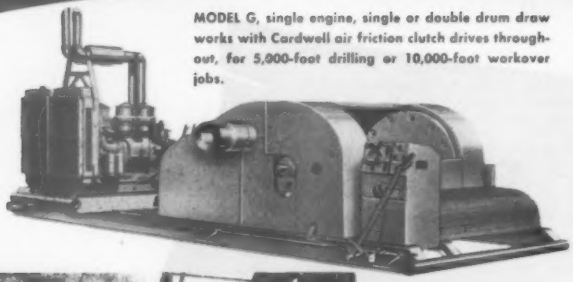
23. Nelson, W. L., "Lead Response of Gasolines (S. R. and Natural)", The Oil and Gas Journal, Oct. 13, 1945, p. 145 (Refiner's Notebook No. 63).



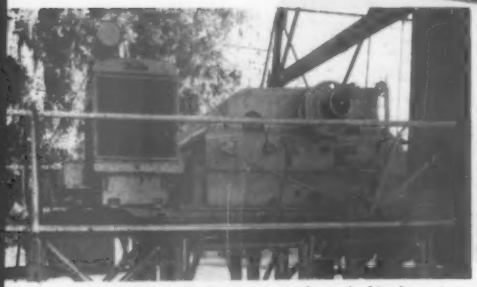
MODEL O, completely driven by Cardwell air friction clutches, is available with two or three engines for drilling to 10,000 feet with 4½-inch drill pipe.

"TRAILERIG" is a full scale, completely unitized rig for drilling to 5,000 feet with 4½-inch drill pipe. Complete unit is moved in one piece with lines and block fully reeved.

FASTER DRILLING, FASTER ..... WITH THESE CARDWELL

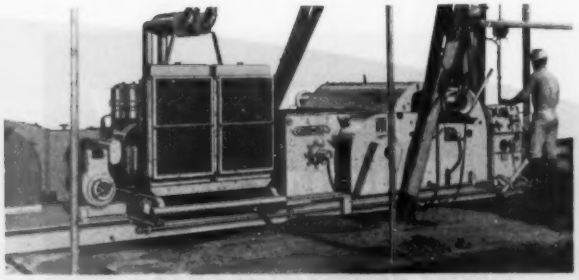


MODEL G, single engine, single or double drum draw works with Cardwell air friction clutch drives throughout, for 5,000-foot drilling or 10,000-foot workover jobs.

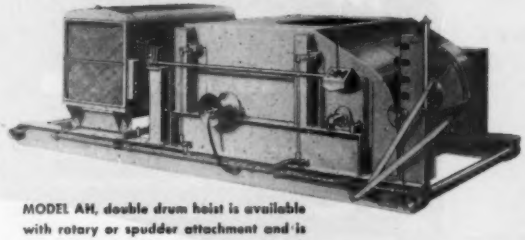


MODEL L, single engine, single or double drum draw works for 3,500-foot drilling or 7,000-foot workover jobs. Completely equipped with Cardwell air friction clutches for fast operation.

MODEL R, combination rig for rotary drilling to 4,500 feet or cable tool drilling to 7,500 feet. Shown with 65-foot, double-leg mast. Available in two smaller sizes: Models H and K.



MODEL D, single- or twin-engine draw works driven by Cardwell air friction clutches, including four-speed and reverse transmission. Recommended for 5,000-foot drilling and 10,000-foot workover jobs.



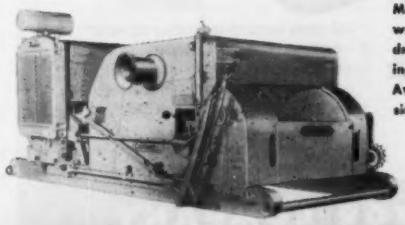
MODEL AH, double drum hoist is available with rotary or spudder attachment and is driven throughout by Cardwell air friction clutches — recommended for well servicing to 5,000 feet. Torque converter is available.

"TRAILERMAST," combined with an old or new draw works, makes a portable rig that can be moved complete and rigged up in a few minutes. Three sizes of "Trailermasts" available.

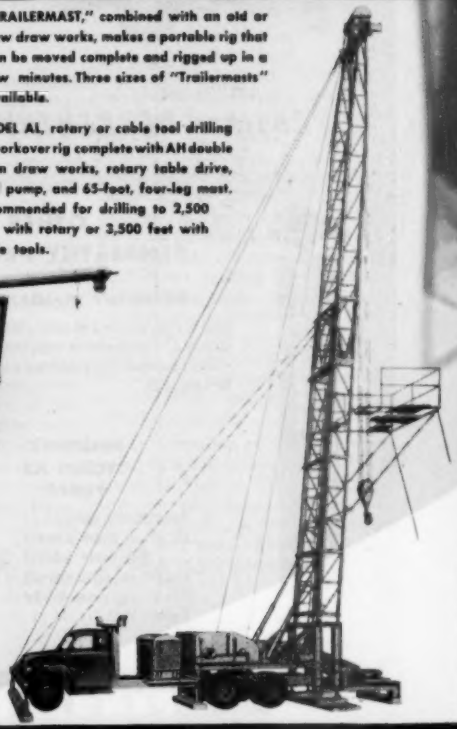
SERVICING RIGS!

MODEL AL, rotary or cable tool drilling or workover rig complete with AH double drum draw works, rotary table drive, mud pump, and 65-foot, four-leg mast. Recommended for drilling to 2,500 feet with rotary or 3,500 feet with cable tools.

MODEL AH or MODEL AQ, single drum servicing hoist, for 5,000- and 3,000-foot servicing respectively. Equipped with Cardwell air-controlled friction clutches in the drum. Truck or skid mounting. Single- and double-leg masts are available.



MODEL LS hoist with Cardwell air friction clutch drum drives for 6,500-foot servicing. Single or double drum. Available with rotary drive, single- and double-leg masts.



CARDWELL

REG. U. S. TRADE MARK PAT. OFFICE

THIS TRADE MARK INSURES HIGHEST QUALITY AT LOWEST PRICE

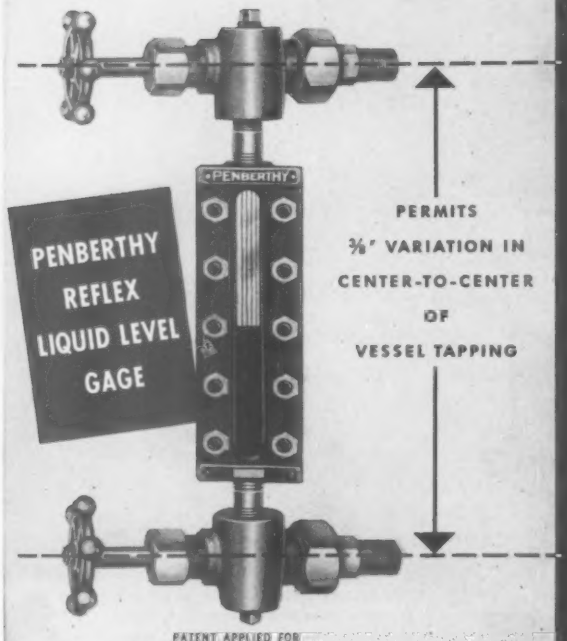
CARDWELL MFG. CO. INC.

P. O. Drawer 2001 . . . Long Distance Telephones 128—129—130

Cable Address: "ALL STEEL," Wichita — "CARDSTEEL," New York

Wichita, Kansas, U. S. A.

TWENTY-FIVE YEARS SERVING THE OIL INDUSTRY CARDWELL



PATENT APPLIED FOR

Another PENBERTHY First

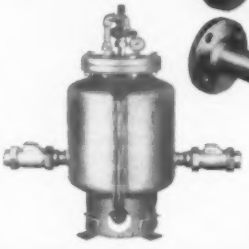
PENBERTHY "Floating Shank" *Saves Time and Money* in Gage Installation

A feature available only on Penberthy drop forged steel (and alloy) gage valves, the "floating shank" automatically compensates for as much as ⅜" variation in the center-to-center distance of the vessel tapping. This saves time and cuts the cost of gage installation . . . eliminates stresses often induced during mounting. Penberthy "floating shank" is available at slight additional cost. It will pay you well to specify "floating shank" on your next gage order.

OTHER PENBERTHY PRODUCTS

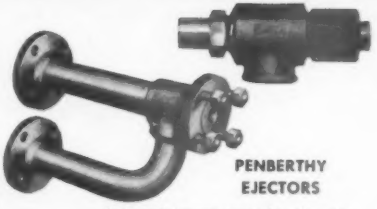
PENBERTHY TRANSPARENT GAGE

Used to observe color and density of liquids under high pressures and/or temperatures. Exceptionally sturdy construction—liquid chamber machined from solid block of metal. Ask for Catalog 35.



PENBERTHY CYCLING JET PUMPS

Automatically operated by air, gas or steam pressure . . . Will pump without clogging any liquid that will flow through pipes. Ask for Bulletin 5030.



PENBERTHY EJECTORS

A simple jet pump operated by air, water or steam. Needs no lubrication . . . will not get out of order. Made in wide variety of materials and special units developed to meet unusual conditions. Ask for Bulletin 512.

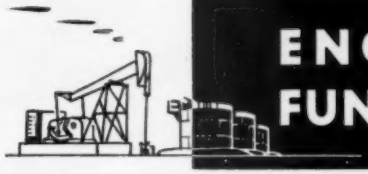
4671

PENBERTHY INJECTOR COMPANY

DIVISION OF THE BUFFALO-ECLIPSE CORPORATION

DETROIT 2, MICHIGAN

Established 1886 — *Canadian Plant, Windsor, Ontario*



No. 489

Combating Natural-Gas Hydrates

by Ralph F. Nielsen*

A COMMON trouble in natural-gas transmission is that of "freezing" due to natural-gas hydrates. This may occur when a natural gas containing water vapor is cooled by expansion from a high pressure or as a result of weather conditions. These hydrates form as a snow-like material and may cause serious plugging.

A natural-gas hydrate is a chemical compound formed with a hydrocarbon and water. The formulas are written as CH_4nH_2O for methane hydrate, $C_2H_6nH_2O$ for ethane hydrate, etc., where n is about 6. For any one of these in the pure state the usual chemical equilibrium equation may be written:

$$CH_4nH_2O = CH_4 + nH_2O \quad (1)$$

The chemical equilibrium constant is given by

$$\frac{(CH_4) \times (H_2O)^n}{(CH_4NH_2O)} = \text{const.} \quad (2)$$

at some one temperature, where parentheses denote concentrations of the materials within them. If the gas is saturated with water vapor at the given temperature, $(H_2O)^n$ is a constant for that temperature, and this may be incorporated in the other constant. The concentration of a gas component such as methane is generally expressed as the partial pressure, that is, the mol fraction times the total pressure.

It has been found by various investigators that the hydrates form solid solutions, that is, the various hydrates are molecularly dispersed in the crystal lattice of the "snow." The concentration in the solid state is therefore best expressed as its mol fraction in the solid. A set of constants for each hydrate for a series of temperatures, assuming saturation with water vapor, may thus be prepared from experimental data:

*Associate professor, petroleum and natural gas engineering, Pennsylvania State College.

$$\frac{\text{Part. Pres. of HC}}{\text{Mol Fr. of HCnH}_2\text{O in snow}} = \text{const.} \quad (3)$$

For calculation purposes it is convenient to divide Equation 3 by pressure and write

$$\frac{\text{Mol Fr. of HC in gas}}{\text{Mol Fr. of hydrate in snow}} = \frac{\text{const.}}{\text{pressure}} = K \quad (4)$$

K will depend on both pressure and temperature. Such K's may be found in the literature.[1]

To determine whether hydrates will form at a given temperature and pressure on the basis of these K's it is necessary to have a fractionation analysis of the gas. Let K_1 denote the constant for methane, K_2 that for ethane, etc., y_1, y_2,—mol fractions of methane, ethane, etc., in the gas, and x_1, x_2,—mol fractions of the respective hydrates in the snow. Then $y_1/K_1 = x_1$, $y_2/K_2 = x_2$, etc. Starting, therefore, with the analysis of the gas (see table) and the K's for the conditions in question, a series of x's may be computed. But mol fractions must add up to unity. Therefore, if the sum of the y/K's is less than one, the hydrocarbon concentrations are insufficient to form the hydrates. If, however, this summation is greater than unity, the hydrates may form. The latter case is illustrated by the table.

CALCULATION TO DETERMINE WHETHER HYDRATES MAY FORM

Compound—	Mol fr. in gas y	K at 500 psi. and 50° F.	y/K = x
Methane	0.906	1.5	0.604
Ethane	.065	.38	.171
Propane	.016	.054	.296
Butanes	.013	.035	.372
Total			1.443 > 1.0

The amount and composition of the snow might, theoretically, be calculated by a trial and error material balance method, such as used for vapor-liquid equilibria. There is usually no practical reason for making such a calculation and, besides, the process would not be analogous to a true "flash" equilibrium.

It may be desired to determine whether hydrates may form following expansion through a valve. In that case the cooling effect would have to be determined. If an enthalpy chart (Engineering Fundamentals No. 488) for a similar gas is available, this might be used to obtain the temperature drop.

If the gas is not saturated with water vapor, there is of course less tendency for hydrates to form. It will be recalled that the n'th power of the saturated water vapor pressure was included in the constants. Hence if the gas has a certain relative humidity with respect to water vapor at the temperature of the calculations, the K's should be divided by the n'th power of the relative humidity (expressed as a fraction) before making the calculation shown in the table. In the majority of such cases, however, the liquid hydrocarbon dew point would probably be reached before the conditions for hydrate formation, so that a calculation based on the analysis would not be valid.

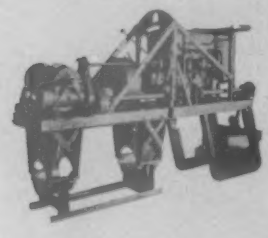
The formation of hydrates is favored by a low temperature and high pressure. That is, the K's decrease with increasing pressure and decreasing temperature. According to Equation 4 they should be inversely proportional to the pressure at constant temperature. If the total of the last column had been unity, the hydrates would, theoretically, just begin to form at the pressure and temperature for which the K's were selected.

References

1. Carson and Katz, A.I.M.E. Trans. 1942, p. 150.
2. Katz, A.I.M.E. Trans. 1945, p. 140.

America's finest Pipeline Equipment!

CROSE Auger-Type ROAD BORING MACHINE



CROSE-LITTLEFORD PIPE LINE KETTLES

CROSE LINE-TRAVELING CLEANING AND PRIMING MACHINE

CROSE INTERNAL LINEUP CLAMP

CROSE PIPE CUTTING AND BEVELING MACHINE

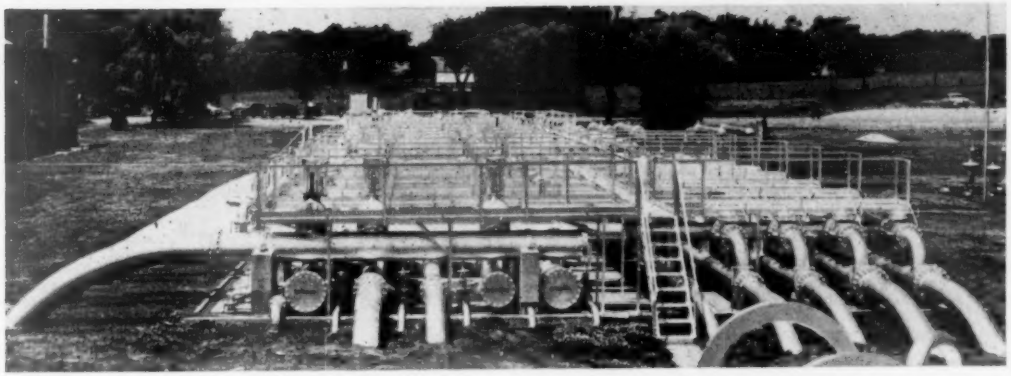
CROSE LINE-TRAVELING COATING & WRAPPING MACHINE

m. j. Crose

Manufacturing Company, Inc.

2715 DAWSON ROAD • PHONE 6-2172 • TULSA, OKLAHOMA

BRANCH OFFICES IN HOUSTON, SAN FRANCISCO • EXPORT OFFICE, NEW YORK CITY



STATION MANIFOLD at Freeman station of Service Pipe Line Co.

CRUDE-OIL PIPE LINING . . .

How Service Keeps 'em Pumping

This pipe-line company is carrying on a vigorous program of expansion and modernization. Here's a rundown of some of its and the industry's accomplishments.

by A. H. Newberg

CURRENTLY 1,000,000 tons of crude oil and refined products is being moved daily via pipe line. Thanks to modern equipment and techniques this huge operation is being carried out at a high degree of efficiency. Free exchange of ideas and experiences among operating companies, equipment manufacturers, and the technical groups of other organizations is responsible for this efficiency.

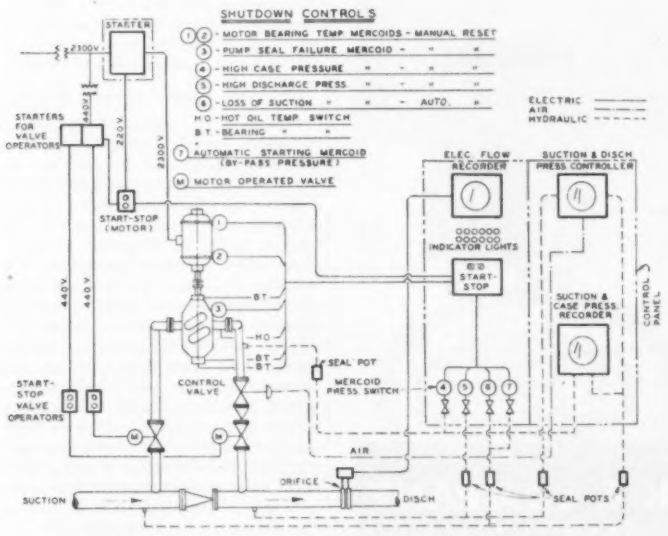
Typical of the degree of efficiency attained in modern pipe-line operations is Service Pipe Line Co. This company carries out one of the most efficient operations in the country today. Service Pipe Line Co.'s operations date back a number of years.

Service, in 1943, installed the first industry-built "big inch" pipe line. It also pioneered in station electrification with closed-system operation. These are only two of the many advancements Service Pipe Line has participated in during the past decade and are indicative of its viewpoint on developments for the pipe line of the future.

The commercial manufacture of high-strength pipe has permitted Service Pipe Line Co. to carry out its pipe-line expansion and modernization program since the middle of 1951 with a significant reduction of new tonnage. Pipe with a minimum of 42,000 psi. yield strength as compared to 35,000 for so-called "B" pipe used in the past was selected and to date no welding troubles have been experienced.

Difficulty was experienced in obtaining satisfactory welds for yield strengths above 42,000 psi. However, through continued research by all interests, experience now indicates that even higher-strength pipe can be satisfactorily laid and welded provided proper precautions are observed.

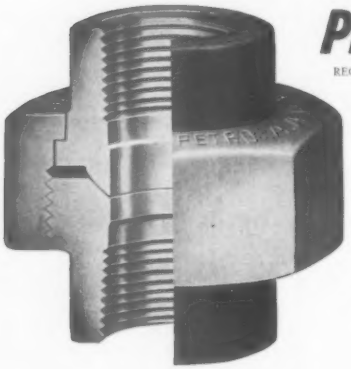
While the present method of welding along the right-of-way is satisfactory, it still represents a hand rather than a production-line method. There is need for a portable electric machine which will join the pipe ends together



AUTOMATIC CONTROL system used in pipe-line stations.

THEY'RE AMBIDEXTROUS

PETRO FORGED STEEL UNIONS AND UNION CHECK VALVES WILL DO ANYTHING AND EVERYTHING THE WAY YOU WANT IT DONE

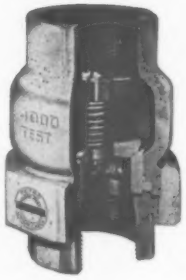


PETRO A. A. R.
REG. U.S. PAT. OFF.

Specify PETRO unions for any and all services on pressures to 3000 lbs. C.W.P., and temperatures to 1000°.

PETRO UNION CHECK
REG. U.S. PAT. OFF.

PETRO UNION CHECK Valves will work in any position—vertical, horizontal, or upside down, and on any service on pressures to 2000 lbs., and temperatures to 600° F.



Write Department G for new illustrated catalog or refer to listings in Chemical Engineering Catalog pages 1120-1121, Composite Catalog pages 3140-3141 and Refinery Catalog page 653.

ORDER BY TRADE NAME FROM YOUR LOCAL JOBBER

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1917

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS

THE AUTHOR

A. H. Newberg is chief engineer of Service Pipe Line Co., Tulsa, having assumed that position in December 1947. Newberg has been employed by Service for 7 years. During that time he has played an active part in preparing hydraulic and economic studies connected with pipe-line expansion plans. Prior to 1945, Newberg was employed for 3 years by Williams Brothers Corp., in the Panama Canal Zone where he worked on the underground oil storage program of the Navy. Newberg was graduated from University of Nebraska in 1940, with a B. S. degree in civil engineering.

instantaneously and thus speed up the field construction and insure a strong, safe, and uniform weld. Considerable experimental work and research is now being carried on among the pipe-line engineers, contractors, pipe manufacturers, and welding suppliers in this direction.

Some pipe-line contractors have recently introduced the use of the automatic welder for making continuous welds in the field. This has considerable promise towards obtaining better welds but has yet not proved too advantageous in improving laying progress and consequent reduction in cost. The pipe fabricators have contributed their part to progress by better methods of rolling, pressing, welding, expanding, and testing large-diameter pipe.

To assure obtaining better welds, particularly in the higher-strength pipe, X-ray inspection has been adopted in the field. This is proving economical as compared to the previous practice of cutting out sample welds for testing.

Protection From External Corrosion

Protection of pipe lines from external corrosion is still a problem. Progress is being made, and the pipe-line research groups have developed better ways of cathodic protection for preventing pitting. Service Pipe Line now has approximately 1,750 miles of trunk lines under complete protection with rectifier units, and 2,950 miles under partial protection with sacrificial anodes. This represents 56 per cent of the total trunk miles. Individual anodes lend themselves best for protecting bare lines and for local "hot spots" on coated lines. Service Pipe Line leak-repair policy on both trunk and gathering lines not completely protected now includes the installation of three magnesium anodes at the location of each external pit leak as part of the permanent repair of that leak.

In recent years glass-fiber wrappings

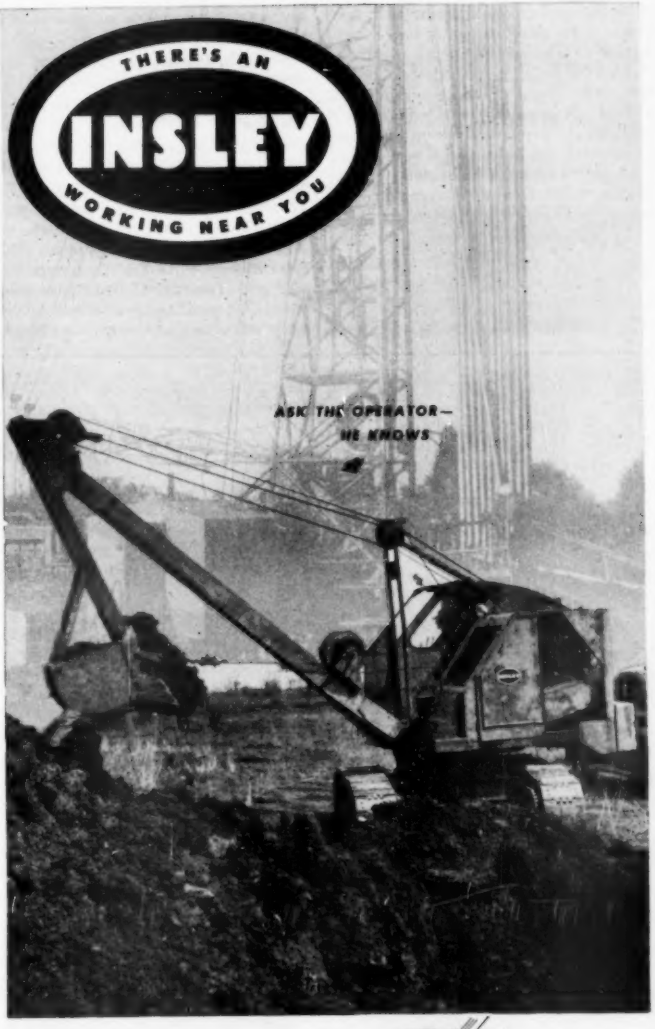
have proved of real value and the quality of felts and wrapping papers has continued to improve. Companies making coal tar and asphalts for pipeline protection have also demonstrated their ability to produce better products for application to the pipe along the right-of-way. Service Pipe Line Co. engineers are participating in the testing of many of these new materials and have presented results and recommendations for improvements.

By way of speculation, recent developments indicate the possibility of using a composition or synthetic pipe which is completely resistant to ordinary corrosion. There are several types of such pipe now being commercially introduced. One is the fiber-glass reinforced plastic pipe which makes a strong, lightweight, durable conduit suitable for many purposes. There seems to be a future for this type of steel substitute, particularly if a satisfactory field joint can be developed which would be as strong as the pipe itself and in no way interfere with the laying or handling of the line. However, it is not presently believed that plastic pipe used in a crosscountry trunk pipe line would afford enough protection against vandalism, or accidental damage by highway, farm, or pipe-line equipment.

Fluid-Flow Characteristics

Need for segregation of various crudes in the pipe line, along with greater capacity of large-diameter lines, has made necessary a thorough investigation of fluid-flow characteristics in order efficiently to operate a modern pipe-line system. A 1 per cent error in calculating the capacity of a 20-in. line system represents significant traffic volume and revenue as compared to that represented by 1 per cent of the capacity of older lines, 12-in. and smaller. Consequently, complete knowledge of all characteristics of lines and crudes takes on increasing importance. Service Pipe Line engineers are continually making analyses of various crudes handled. They are also checking actual field operating conditions by selecting test sections and making pressure, temperature, and flow measurements in an effort to improve the technique for determining available capacity to handle pumpings on a current basis and also for accurate selection of new lines to meet increased pumping requirements. Service Pipe Line Co. actively participates in and contributes information to various flow-research activities in the industry such as the American Petroleum Institute and the American Society of Mechanical Engineers.

Service Pipe Line Co., perhaps more



The INSLEY operator knows..

PROJECT RATED
INSLEY
BY THE USER—FOR THE USER

that Insley Equipment can be rated-for-the-project . . . he knows that specification alternates make it possible to buy the exact equipment to do his job best.

INSLEY MANUFACTURING CORPORATION • INDIANAPOLIS 6, INDIANA

than any other pipe-line company, has followed the development of new diesel-engine designs and operating practices. It has also led in a program of renovation, alteration, or modernization of almost all engines installed on the system. The primary function has been to increase reliability and available full-load time between overhauls. Some of the major alterations completed or being worked on to date are:

1. Replacement of inertia governors with quick-acting hydraulic governors.

2. Installation of oil-cooled pistons to replace water-cooled pistons.

3. Removing air compressors and replacing air-injection equipment with solid-fuel injection.

4. Replacement of high-pressure with low-pressure air starting.

5. Converting engines from oil to dual fuel.

6. Installing turbochargers on engines originally designed for atmospheric operation.

Pioneering new designs requires substantial expenditures. However, the results achieved definitely prove that Service Pipe Line Co.'s program has paid off. The first United States commercial supercharger installation was made on a company engine at Odessa, Mo., in 1936. This was over a year before any engine builder offered a truly supercharged engine for general use. Although some discouraging troubles occurred, Service Pipe Line continued to experiment with the supercharger and received a good return from the knowledge accumulated during the early trials.

Supercharging Engines

Between 1941 and 1945 required capacity increases were met by successfully supercharging 37 engines when no new engines were available. Thirty-five of the engines supercharged were in main-line stations from Freeman to Whiting where it was proposed to increase pressures from 500 to 750 psi. in successive steps to obtain a 28,000-bbl. per day increase. This required an 84 per cent increase in horsepower output of the engines. Thirty-five per cent of this, or 9,000 hp., was obtained by supercharging and increasing the speed of certain units. With an average cost of $9,800 per engine for supercharging, the cost of the additional output averaged $38 per horsepower as compared to $250 per horsepower for new diesel-driven equipment. Ten more engines were supercharged during the 1947-48 expansion program and all new diesel or dual-fuel units were purchased as supercharged engines.

As far as operating economics is concerned, probably the most outstanding developments in pipe-line equipment in recent years is the dual-fuel engine. Such units will operate on 100 per cent liquid fuel but they can be thrown over immediately to run on as high as 90 per cent gas fuel. In addition to the high thermal efficiency from this type of internal-combustion engine, it has a distinct economic advantage in locations where natural gas is available. To meet needed increase in horsepower from 1946 through 1948, Service Pipe Line took the lead in installing this type of engine where gas was available.

Service Pipe Line was among the first to recognize the potential advantages of the vertical-type higher-speed reciprocating pump introduced by some manufacturers for high-pressure service in oil production and salt water disposal. Initial installations of five-cylinder pumps, rated at speeds of 180-225 r.p.m. compared with 40-60 r.p.m. for horizontal-stroke pumps, were made in 1943 with engine drives. One advantage from such units was to eliminate the speed-reduction gear between engine and pump, at a cost of $4,000 to $12,000 depending on the unit size. Compactness of the unit considerably reduced the size of build-

. . . . No Corrosion Here!
Certainly not—not with the line coated with Reilly Enamel, perhaps the finest protective coating obtainable for water, gas and oil transportation lines.
Naturally Reilly Enamel meets all standard and special specifications for coatings used in or on water conduits, sewage lines, water tanks or other steel surfaces exposed to corrosion, incrustation or tuberculation.
Reilly
PROTECTIVE COATINGS
REILLY TAR & CHEMICAL CORPORATION
MERCHANTS BANK BUILDING
INDIANAPOLIS 4, INDIANA

ing required to house it, whether with engine or motor drive. Many problems were early encountered such as low volumetric efficiency, and excessive surges and vibrations. These were overcome, however, through design changes worked out with the manufacturers which enabled gradual increases in speed and consequent higher pump output ratings. As line capacity increases were required, larger motors or engines were provided for the pumps until by 1949 Service Pipe Line Co. had 7-cylinder units running at speeds from 225-277 r.p.m. These units developed up to 2,100 hp. from direct connected dual-fuel engine power for outputs of 80,000-100,000 bbl. per day at 1,000 psi.

The recent increasing trend toward electric motors instead of gas and oil engine drivers is due principally to three factors:

First, the increasing reliability of electric power supplies.

Second, a continually increasing improvement in the ratio of the cost of electricity versus fuel oil or gas as an energy source.

Third, the recognized advantages of electrified sequence control such as foolproof construction with better continuity of operation, cleanliness, reliability, and ease of control in operating large pump stations on large-diameter lines.

To possibly provide keener competition with electric power in the future, engine manufacturers are showing promise in developing more efficient and economical equipment. There is the spark-ignited gas engine and also the possible application of the gas turbine to pipe-line pump stations. This latter comparatively new driver has been developed to utilize gas or liquid fuel. Consequently it can be readily adapted to operations where natural gas is available, or used at the trunk-line pump stations where liquid fuel is available.

So far the indicated fuel economy of this new turbine does not compare too favorably with gas or diesel engines but the driver has other advantages such as light weight and portability. Further, it has a wide speed range and can be directly connected to a centrifugal pump making a very compact and efficient pipe-line unit.

The trend is also toward the use of more and more automatic controls. For some time the stations of many trunk lines, particularly products lines, have been equipped with automatic pressure controls to permit all stations on the line to operate "in step." This arrangement enables the oil to move from origin to destination without having to enter station working tanks where intermixture between successive pumpings occurs. Such conditions are essential when segregated batches of different oils are to be delivered without intermingling of batches. Also, as larger gate and stop-valves must be opened and closed on larger-diameter lines, it is becoming imperative to use motor-driven valve operators that can be adapted to automatic control.

Sequence Relay Controllers

Some of the latest stations incorporate sequence relay controllers which perform many operations. For example, the Ozark crude-oil pipe-line system constructed within the last 2 years is equipped with stations which use two 1,500 and one 750-hp. motor-driven pumps to deliver about 275,000 bbl. of crude oil daily. Manipulation of three buttons on the console by a single employe will cause automatic performance of 12 operations in 6 minutes that would otherwise take 2 or 3 men an hour to accomplish.

With a revenue of $75 per minute depending on getting a line under way, the direct saving to be gained by a $10,000 investment in sequence controllers is obvious. Perhaps even more important is the insurance of a foolproof job of starting. Any group of men having 12 critical operations to be performed in a required sequence can easily make an error that might cause an accident and further losses. Similar equipment to a major extent is equally applicable and effective on a large station driven by oil or gas-engine prime movers.

Current plans for installing electric units totaling 25,000 hp. on the main-line systems of Service Pipe Line include the latest developments in control facilities. On the 8-in. system from Drumright, Okla., to Manhattan, Ill., 300-hp. units are being installed outdoors away from larger machinery and will be equipped for automatic operations as a closed system. With a control panel for the unit in the station

See Composite and Refinery Catalogs, or Write for Folder on

FLEET-LINE

PIPE SADDLES

Nozzle sizes from ¼" to 24"

ASTM A234

STEEL FORGINGS, Inc.

P. O. BOX 276-B SHREVEPORT, LA

MOLE

Pipeline

Cleaner

for BETTER cleaning of

CRUDE LINES

PRODUCT LINES

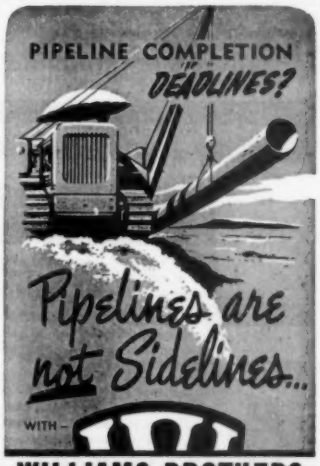
NATURAL GAS LINES

FOR DETAILS WRITE

Pipeline Cleaners Co.

Fort Madison, Iowa

PIPELINE COMPLETION DEADLINES?



Pipelines are not Sidelines...

WITH

WILLIAMS BROTHERS

TULSA NEW YORK

ATLANTA LOUISVILLE

Caracas • Maracaibo • Bogota • La Paz

ENGINEERS·CONTRACTORS

Oil—Gas—Products—Water

Pipelines and Pumping Stations

PIPE LINE
WESTERN
AUSTIN TEXAS
CONSTRUCTORS
EXPERIENCE
is the
Difference
JAMES P. NEILL
President
CHARLES S. LeNOIR
Vice-President
E. G. MORRISON
Secretary
LOCKHART BUILDING
311 EAST ELEVENTH
AUSTIN 2, TEXAS

building, the engineer on duty can observe and inspect performance of the outdoor unit. Larger electric-centrifugal units up to 1,500 hp. will be installed in the present building in the space now occupied by a 34-year-old 250-hp. diesel-engine-driven unit. This old unit has been improved and made more efficient since being installed, but the building area required per unit horsepower relegates it to the junk heap, since the building space can be used more economically to house modern units. This is a true example of obsolescence, since three 1,500-hp. electric units (4,500 hp. total) can be installed in the same space now required for the old 250-hp. unit.

One of the Service Pipe Line Co. automatic stations in West Texas, known as Slaton, has been in operation about 2 years. Slaton is a relay station at the hydraulic midpoint of the 50-mile 8-in. Post-Monroe line. It consists of two 400-hp. electric-centrifugal units and is designed to handle 32,000 bbl. per day. It represents a total investment of $50,000. The station is attended periodically by a gager who runs oil from two small gathering systems and furnishes the necessary station supervision, inspection, and minor maintenance. Operation is automatically controlled by the pumping conditions at Post station, 23 miles upstream. This is an example of combining scientific technique, native ingenuity, and ability of control equipment to supplement or replace manual operations.

Simplified Dispatching

Dispatching is being simplified and expedited by the increased use of private telephone and teletypewriters in many pipe-line systems. Radio now provides two-way communication with personnel in isolated or scattered work locations and with patrol planes, thus permitting more efficient work planning and more accurate working knowledge of oil-movement operations.

The newest communication tool is microwave radio. Through the efforts of and because of the ready acceptance by the pipe-line companies, microwave, in a scant 2½ years, has developed into a method of communication that poses serious competition to other point-to-point communications. Based upon performance rendered, it is reasonable to predict that within 5 years microwave will cover more than 80,000 miles of operation. Service has a major microwave system proposed in its 5-year expansion and modernization plans.

The multiplicity of circuits available in a microwave system permits use of many supervisory controls in addition to normal voice service—plus teletype, and even facsimile. Pump motors may be started or stopped; pressures, speed, power demand, and gravity readings may be transmitted and recorded; and lights on dispatching boards at headquarters show automatically whether units are idle or operating.

Pipe-line engineers have taken a leaf from the book of those who transport kilowatts. A booster pumping station and a main-line valve of the Pan American Pipe Line in Texas will be controlled entirely by an operator in a station 40 and 80 miles away respectively. The control also gives him, automatically, indications of conditions at the two unattended points, even including presence of hazardous gas in the station building, and any abnormal pressures or bearing temperatures. Various pressures and motor currents are transmitted to him continuously. The supervisory-control apparatus even checks itself and the circuit and, if it should become inoperative for any reason, it "says" so by signal which locates the circuit or apparatus trouble.

Research and development become more important and necessary as operations become more complex, as equipment and lines require more maintenance or become obsolete, and technological advances cause changes in operating practices.

There's nothing like a VOSS VALVE
to make good compressors operate better
to make worn compressors operate like new!

It is a matter of record that every time an ordinary compressor valve is replaced with a specially designed VOSS valve, the immediate result is increased efficiency and greater output . . . and this record covers thousands of installations.

VOSS VALVES are made to specifications for all types of air, gas and ammonia compressors; from 1" to 16" in diameter and for pressures from minus 27HG to 7,500 pounds and for speeds up to 1,000 rpm and above.

VOSS VALVES are machined from solid stock (not cast)—PLATES are machined and ground (not press formed) for precise high-tolerance fit; VALVES and PLATES are of heat-treated alloy and stainless steel; the PLATES are dimensionally stable, ductile, resist fracture, high temperatures and corrosion; withstand fatigue; won't chip, crack or score cylinder walls.

Don't be fooled by similarity in appearance. Be sure your replacement valves and plates are marked "VOSS" and obtain the VOSS values developed by 32 years of specialized compressor valve engineering and experience.

VOSS VALVES and PLATES ASSURE
- Quiet, vibration-free operation
- 20 to 60% more valve area
- Less power consumption
- Low Pressure loss
- Normal discharge temperature
- Lower operating costs

To increase the efficiency of your compressor, send us the name, bore, stroke and speed of your machine. Our detailed proposal will be sent without obligation.

J. H. H. VOSS VALVES
REG. U.S. PAT. OFF.
J. H. H. VOSS CO.
INCORPORATED
786 East 144th Street, New York 54, N. Y.

SAFE

Walker

HYDROMETER

CASES

Dual Type

Help Stop Breakage in Field

Increase safety, reduce risk of breakage—carry and store hydrometers in Walker single, dual and triple Hydrometer Cases. Exclusive safety latch and strong hinges prevent accidental opening—latch enables case to be opened with one hand. Felt lining greatly reduces risk of breaking and scratching of hydrometers. Light weight, non-sparking aluminum case is convenient to carry. See your Supply Store now, or contact us direct.

QUALITY WLW SERVICE

EVERYTHING THE GAUGER NEEDS FROM ONE DEPENDABLE SOURCE

- WALKER TULSA OIL THIEF
- CENTRIFUGE MACHINE
- GAUGING TAPES
- SAMPLE HEATERS
- STRAPPING KITS
- CARRYING CASES

W. L. WALKER CO.

Phone 2-1148

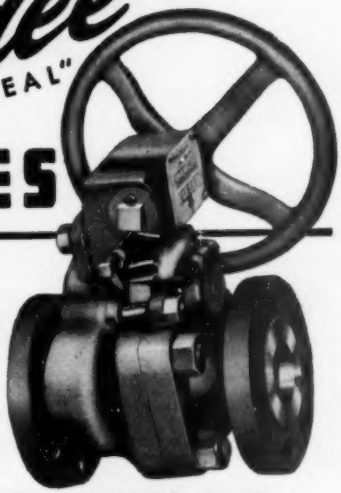
1009 South Main Tulsa, Oklahoma

APPROVED

Okadee

"PERFECT SEAL"

VALVES



for Bubble-tight Primary Shut-off in

L P GAS LINES

Underwriters' Laboratories, major LP gas producers*, and Liquified Petroleum Gas Commissions of several States* approve Okadee Valves for primary shut-off in LP gas lines. In addition, Okadee Valves are used in virtually all types of gas and liquid lines at pressures to 600 p.s.i. and temperatures to 800°F.—wherever a perfect seal, low maintenance and long life are necessary.

Get complete data, including material specifications, on Okadee Valves — and newest Underwriters' Laboratories test report—without obligation, today.

**Names on request.*

- A. S. A. Standard dimensions
- Sizes from ½" to 6"
- Single- and double-seated disc valves
- Hard-faced valves and seats . . . perfect metal-to-metal seal
- Self-cleaning, self-compensating valve discs
- Lever, rack-and-lever, or worm-gear operation
- Non-lubricated
- No wedge action
- Valves and seats wear in instead of "wearing out"
- All parts quickly replaceable in the field
- Inside and outside stem packing . . . double assurance against stem leaks

Underwriters' Laboratories Reexamination Service Guide No. 141 A3.1.22, File MH5163. SL Screwed Type Series and Series 15 and 30 Flanged Type Okadee Valves are suitable as a positive shut-off in LP gas pipelines and other LP gas applications for a working pressure of 250 p.s.i.

UNDERWRITERS' LABORATORIES REEXAMINATION SERVICE UL

Write for Bulletin No. 51FL

OKd. *Okadee* COMPANY

332 South Michigan Avenue • Chicago 4, Illinois

NEW FACILITIES

for Fluor's Mid-Continent Division

A complete organization for the design, engineering and construction of plants and facilities for the petroleum, chemical and allied industries

To better serve the tremendous industrial growth of the Mid-Continent and Gulf Coast areas, Fluor's Mid-Continent Engineering Division has recently moved into new and permanent headquarters in Houston, Texas. These new and completely modern facilities are designed specifically for the efficient and expeditious handling of a large variety of engineering and construction services for the petroleum, natural gas, chemical and allied industries.

In addition to these on-the-spot services offered by the Mid-Continent Engineering Division, other important advantages and considerations include: strategically located storage and maintenance facilities for construction tools and equipment at Paola, Kansas; recourse to the broad engineering and research talents of the *entire* Fluor organization; and, the financial security and buying power of a major company—one with national recognition and over a half century of experience.

MODERN FACILITIES

Fluor's modern building pictured above was completed in mid-1952. A second building is to be completed in late 1952. Both buildings are air-conditioned and are designed on a compartmental basis to provide engineering offices, drafting rooms, blueprint rooms, supply and storage areas, and offices for accounting, purchasing and administrative personnel. Each building contains 15,000 square feet of floor space—a total of 30,000 square feet devoted exclusively to the work of Fluor's Mid-Continent Engineering Division.

FLUOR

Engineers - Constructors - Manufacturers

THE FLUOR CORPORATION, LTD. · LOS ANGELES · HOUSTON
New York, Chicago, Pittsburgh, Boston, Tulsa, San Francisco, Birmingham and Calgary

Represented in the Sterling areas by
Head Wrightson Processes Ltd., Teesdale House, Baltic Street, London, E.C.1, England

NATURAL GAS

Work Under Way on Safety Code for Pressure Piping

CHICAGO.—The newly organized national subcommittee on gas-transmission and distribution safety has begun work on the formulation of a safety code covering the material, design, fabrication, installation, testing, and operation of gas lines and related facilities.

The subcommittee is headed by F. A. Hough, vice president of Southern Counties Gas Co. of California, Los Angeles. It is sponsored by the American Gas Association, the American Standards Association, and the American Society of Mechanical Engineers.

The group is using as its starting point a forth-coming document on gas-transmission and distribution systems known as Section 8. It will revise and expand this section where necessary and will publish it as a separate document, "Section 8, Code for Pressure Piping B31.1," on approval by A.S.A.

Spokesmen for A.G.A. said the industry has a long and enviable safety record, but, even so, it is believed that additional steps can be taken to assure safe construction and operation of facilities in view of recent technological developments.

The subcommittee is made up of 52 representatives of gas-transmission and gas-distribution companies; pipe companies; valve and fitting companies; independent research groups; technical universities; consulting engineers; and government agencies. It will review specifications and codes already formulated by other agencies, or, where none exist, it will draw upon the resources of many technical groups participating.

Northern Natural Drilling For Underground Storage

OMAHA.—Northern Natural Gas Co. has started exploratory drilling in southern Minnesota in an attempt to find an underground structure suitable for storing gas.

John Merriam, president, said Northern is working closely with the Minnesota Department of Conservation and the University of Minnesota geological department.

If the exploration is successful it would ease the company's gas-supply problems in Minnesota during the winter, Merriam said.

Northern isn't sure yet, he added, whether it will go ahead with the $38,000,000 expansion program approved by the Federal Power Commission recently *(The Oil and Gas Journal, July 14, 1952, page 150)*.

He said the commission tied a lot of conditions to the expansion job. To name one, he explained, it would be virtually impossible to raise Northern capacity from the present 675,000,000 cu. ft. daily to the authorized 825,000,000 cu. ft. by November 27. Added to this, the commission tied all company reserves to the expansion program and ordered gas supplied to six new communities.

Long Beach Lets Contract For Pilot Injection Plant

LONG BEACH.—Contract to prepare plans for a pilot gas-injection plant to be operated by Long Beach Oil Development Co. in the Harbor area of Wilmington field has been awarded J. B. Gill Co. by the Long Beach Board of Harbor Commissioners.

The plant will be designed to inject up to 6,000 M.c.f. of gas daily and will cost $385,000. Compression facilities will consist of three 550-hp. Clark units which will boost the gas from 40 psi. to a discharge pressure of 1,100 psi.

Plans call for the pilot plant to be in operation about the first of next year. Bids for its construction will be invited as soon as the designer completes the plans.

Should operation of the test plant prove gas injection feasible from the viewpoints both of pressure maintenance and gas storage, the Harbor Commission plans to construct facilities capable of injecting 20,000 M.c.f. daily. The city has contracted to purchase a like volume from properties of Signal Oil & Gas Co. in Huntington Beach field *(see Pipe Line News, page 392)*.

Institute of Gas Technology Fellows

These men are members of I.G.T.'s classes of 1952-53. The 11 men in the front row and four of those in the back row have received their postgraduate degrees and taken employment in the gas industry. Only four men remain in the class of '53. The institute is located at Technology Center in Chicago.

Natural Gasoline

Shell Planning Underground Storage in Wasson Field

AUSTIN.—Shell Oil Co. is seeking Texas Railroad Commission approval of its plan to store L.P.G. underground in two 50,000-bbl. cavities in Section 827, Block D, Gibson Survey, in Wasson field of Yoakum County, Texas.

Shell Atty. Paxton Howard told the commission that the company plans to drill two storage wells to a salt formation about 600 ft. thick in the Wasson field area. This formation, he said, is sealed both top and bottom by massive anyhydrite.

Brine produced in leaching out the cavities, Howard said, would be taken by Frontier Chemical Co. The two projects would be used to store excess L.P.G. produced during the summer by the two Wasson field gasoline plants.

PERRAULT
PERRAULT-AMERICAN TAR-HEATING KETTLES

Available in all capacities from two barrels through thirty barrels. Large capacity tar kettles completely insulated on all four sides, equipped with mechanical agitation, Hauck fuel-injection type burners and Roots-Connersville blowers. For information regarding Perrault-American Tar Heating Kettles contact —

PERRAULT
Brothers Inc.
1130 NORTH BOSTON • TULSA 6, OKLAHOMA
TELEPHONE 5-1103 • EXPORT OFFICE 30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y. PHONE CIRCLE 6-6260
Everything for the Pipeliner

FOR MODERN PIPE LINE WELD CONTROL

RADIOGRAPHY

Cut expenses by eliminating many costly cut-outs. Improve the general quality of welding.

FREE Descriptive folder explaining radiography.

ELDER & McNULTY
8 SOUTH LANSING
TULSA, OKLAHOMA

PIPE LINES

Big Platte Line Delayed Indefinitely Due to Strike

INDEPENDENCE, Kans. — Completion of the big Platte crude line already has been seriously delayed by the steel strike.

The 1,000-wide, 20-in. artery from Rocky Mountain fields to the St. Louis and Chicago consuming areas was scheduled for completion September 1. Platte officials say this target definitely cannot be achieved now and refuse to make any estimate on the actual completion date until the strike is settled.

Two construction crews were shut down last week when they completed welding of the last pipe on hand. A third crew has about 30 miles of pipe left. This will keep it in business for about 3 more weeks.

When this pipe is installed, there will remain two gaps in the line—one a 45-mile hole in northeastern Kansas, the other about 85 miles long in Nebraska west of the company's pump station near Holdrege.

In addition to financial losses incurred by Platte, officials said the strike is costing the Rocky Mountain oil industry about $200,000 in oil sales for each day of delay in completing the line.

Best estimates are that it will be probably about 4 or 5 weeks after the strike ends before construction can be resumed and about 10 or 12 more before the line will be completed.

DPA Grants Tax Aid on $50,000,000 in New Lines

WASHINGTON. — Investments of more than $50,000,000 in 12 new pipeline projects has been approved for accelerated amortization by the Defense Production Administration.

The largest project was a $22,759,900 pipe line to be built by the Buckeye Pipe Line Co., New York, for which quick write-off was granted for 40 per cent of $3,830,500 and 25 per cent of $18,929,400.

Other projects, approved for 25 per cent of the investment except where noted, included $127,000 for crude by Atlantic Refining Co., Philadelphia; a crude line for Gulf Refining Co., et al., Pittsburgh, Pa., 40 per cent of $245,000 and 25 per cent of $5,594,000; $40,969 for crude by Leonard Pipe Line Co., Mt. Pleasant, Mich.; $8,133,000 for crude from Hawkins to Baytown, Tex., by Humble Pipe Line Co.; $8,371,250 for crude by Mid-Valley Pipe Line Co., Longview, Tex.; $322,300 for crude in Upshur and Green counties, Texas, by Pan American Pipe Line Co., $329,200 for natural gas in West Texas by Phillips Petroleum Co.; $223,450 for gasoline by Phillips Pipe Line Co., Bartlesville, Okla.; $4,299,400 for crude by Shell Pipe Line Corp. and Texas Pipe Line Co., Wildhorse Station, Okla.; crude oil in Wichita County, Texas, by Texas Pipe Line Co., 25 per cent of $254,846 and 20 per cent of $97,250; and $252,900 for natural gasoline in West Texas by the Phillips Pipe Line Co.

Southern California Edison Starts New Fuel-Oil Line

LOS ANGELES. — Southern California Edison Co. has started construction of a 40-mile, 8-in. pipe line from Santa Fe Springs on the eastern edge of Los Angeles to its Etiwanda electric generating station near Fontana.

Designed by Bechtel Corp. and being built by J. E. Young Pipeline Construction Co., the line will supply fuel oil for the $38,000,000 plant started in March 1951.

A 9-mile, 12 and 16-in. gas line also is to be constructed from Southern California Gas Co.'s metering station near Colton to the plant. Contract for laying of the gas line has not been awarded.

Scheduled to be completed in about 3 months, the fuel-oil line will be maintained and operated by General Petroleum Corp. Total cost of this line and the three pumping stations will approximate $2,200,000.

The three pump stations, to be built by Bechtel, will be located at Santa Fe Springs, near Brea, and near Chino. Each will contain three direct-fired fuel-oil heaters, four main-line pumps, two booster pumps, one recirculating pump, one sump pump, and two tanks. All pumps will be electrically driven by 440-volt motors.

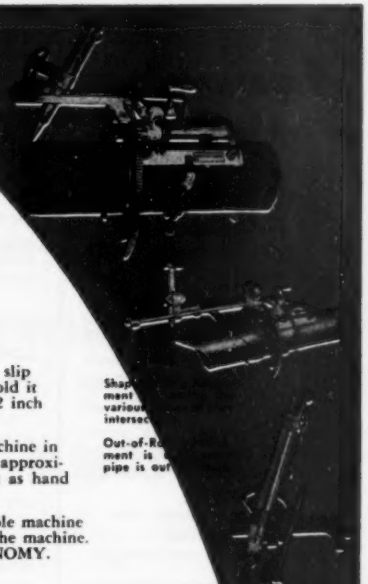
The line will have a capacity in excess of 750 bbl. per hour. It will carry 10°-gravity Bunker C fuel. Fuel for the heaters will be taken from the line.

When placed in operation two of the main-line pumps will operate at

H&M

PIPE CUTTING AND BEVELING MACHINE

Cuts and Bevels Pipe FASTER, MORE ECONOMICALLY



Split horseshoe shaped gear permits machine to slip quickly over pipe. Fast operating snap chain fasteners hold it in place. A complete cut and bevel can be made in a 12 inch pipe in about two minutes.

You'll soon save several times the cost of the machine in labor, gas and transportation charges. H&M takes approximately one-half the labor and gas to make the cut as hand cutting and the work is all done in the field.

Bring this light (24 to 155 pounds) but durable machine to the pipe instead of moving the heavy pipe to the machine. Remember, H&M designs for SPEED and ECONOMY.

ourself. Let us demonstration.

H&M PIPE BEVELING MACHINE COMPANY

311 E. 3rd St. Tulsa,

Phone 3-0241

Trade Mark Reg. U. S. Pat. Off.

A. P. I. PIPE COUPLINGS

All Sizes and Types for Oil Field Use

LINE PIPE COUPLINGS A.P.I.
⅛" to 12"—Seamless and Special Processed—Black or Galvanized

PLAIN TUBING COUPLINGS A.P.I.
1" to 3"—Seamless

EXTERNAL UPSET TUBING COUPLINGS A.P.I.
¾" to 3½"—Seamless

CASING COUPLINGS A.P.I.
4½" to 13⅜"—Long or Short

HYDRAULIC COUPLINGS
⅛" to 3"—Seamless

REAMED AND DRIFTED A.I.S.I.
¾" to 12"—Seamless or Spl. Processed

DRIVE PIPE COUPLINGS
⅜" to 12"—Seamless or Spl. Processed

Consult Our Nearest Quick Service Sales Office:

Albany, N. Y.—Albert L. Becker, 434 Clinton Ave.
Baltimore—Ted Barto, 2301 N. Charles St.
Buffalo—W. E. Spencer & Assoc's, 241 S. Elmwood Ave.
Chicago—Harry A. Jay, 122 So. Michigan Ave.
Denver—Earl H. Jones & Co., 1863 Wazee St.
Detroit—Thomas L. Osberger, 19451 Livernois Ave.
Erie, Pa.—R. J. Maggi, Box 711
Falmouth, Mass.—Wm. F. Bennett, 53 Minot St.
Houston—Henry H. Paris Distributor, Inc., Box 932
Kansas City, Mo.—Wm. J. Hebenstreit, 3122 Coleman Rd.
Los Angeles—James A. Riordan Co., 1400 Santa Fe Ave.
Minneapolis—Lin J. Krause, 200 Lumber Exchange
Narberth, Pa.—J. W. Worthington, 105 Forrest Ave.
Newark, N. J.—Murray Eskin, Industrial Office Bldg.
New York—Henry Stein, 50 Cliff St.
Portland, Ore.—Earl H. Jones & Co., 1233 NW 12th Ave
Richmond, Va.—P. C. Abbott & Co., Mutual Bldg.
San Francisco—Earl H. Jones & Co., 1150 Folsom St.
Seattle—Earl H. Jones & Co., 619 Second Ave.

FACTORY PHONE: WOODSDALE 3296

WHEELING MACHINE PRODUCTS COMPANY

ELM GROVE STATION WHEELING, W. VA.

Announcing

WE CAN NOW SERVE YOU WITH

PITT CHEM
100 SERIES
Cold Applied
TAR BASE COATINGS

Perfect Protection and Corrosion Prevention For Industrial Equipment and Structures

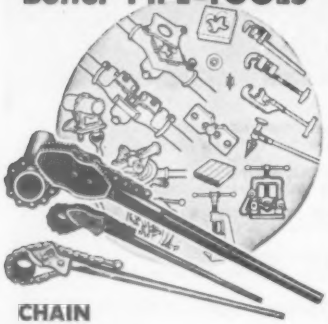
- For use on metal, brick, stone, concrete
- Withstand severest conditions and weathering
- Reduces maintenance cost — maximum protection
- Easy to apply——economical

Available from Houston Warehouse Stock. Write—wire—phone.

DISTRIBUTOR

S. D. DAY COMPANY
1973 WEST GRAY · HOUSTON, TEXAS · PHONE JU-3431

ARMSTRONG BROS.
***Better* PIPE TOOLS**



CHAIN TONGS

"Reversible," "Standard" and "Ideal" types in all sizes. *Jaws* are drop forged from special steel, are carefully milled, heat treated, hardened and tested. The *Handles* are forged spring steel. The *Chains* are proof-tested to ⅔ catalog strength (1,200 lb. to 40,000 lb.). "Reversible" Jaws give double jaw life. "Standard" Jaws have extra bearing on the handle and forged-in chain guides. The "Ideal" Tongs have V shaped teeth for a sure grip on irregular shapes, fittings, etc.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5204 W ARMSTRONG AVENUE · CHICAGO 30, ILL.

constant speed and two at variable speeds. Normally one or two of the constant-speed pumps in each station will be in parallel with one variable-speed pump. Thus the station will be kept "in step."

One of the station tanks is to be a surge tank which will "float" on the line, taking overflow or supplying oil for a deficiency as required. The other tank will contain cutter stock for replacing the heavy oil in the line during shutdowns or in case of emergency.

Long Beach Contracts New 14-Mile, 14-In. Gas Line

LONG BEACH.—Contract for the construction of a 14-mile, 14-in. pipe line from Huntington Beach field to Long Beach has been awarded by the city of Long Beach to Southern Pipe & Casing Co.

The line will be used by the municipal gas department to bring 20,000 M.c.f. of gas daily to this city to augment declining local supplies. Any in excess of demand will be stored in certain reservoirs of Wilmington field in connection with a pressure-maintenance program planned there on city-owned properties.

Cost of construction was contracted at $281,613. That for the total project has been placed at approximately $750,000.

The city has contracted with Signal Oil & Gas Co. for the 20,000 M.c.f. of gas daily. Signal is to receive 18 cents per M.c.f. plus a 2-cent compression charge.

Pipe-Line Briefs

The Federal Power Commission has authorized construction of one new compressor station and received applications for two more. The commission approved Montana - Dakota Utilities Co.'s application for a new 2,640-hp. station in Butte County, South Dakota, to provide more gas for consumption in the Black Hills area. Applications were received from Mountain Fuel Supply Co. for installation of new 2,640-hp. station on its system in Uinta County, Wyoming, and from Southern Natural Gas for a 3,300-hp. station in Logansport gas field in Louisiana.

Arkansas Louisiana Gas Co. will lay a 6-mile gas outlet this summer for the new Scottsville gas field of Harrison County in East Texas. The line will be laid to the company's nearby plant. Now shut in for lack of an outlet, Scottsville field is centered about 10 miles east of Marshall and contains five wet gassers producing from the Petit lime.

Officials of Texas Ohio Gas Co. have announced that presentation of their case before the Federal Power Commission has been adjourned until August 4. During the recess, FPC engineers will study the company's reserves picture to ascertain the ability of the company to meet market requirements if and when its proposed Southwest Texas-to-Ohio gas-transmission line is built.

SLIDE RULE
for
Products Line Calculations

Richardson's H+W 10-in. slide rule for Products Line calculations.

Reading in barrels per hr., specific gravity, diameters, 2½ to 20-in., pressure—lbs. per 1000 ft.—and all "C" values. Price $7.50 each. Discount for quantities.

Address:
JAMES H. CAMPBELL
317 Perry Building
LUFKIN, TEXAS

S. E. HUEY & CO.
ENGINEERS & SURVEYORS
HENINGER BLDG.
MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

NEW PIPE

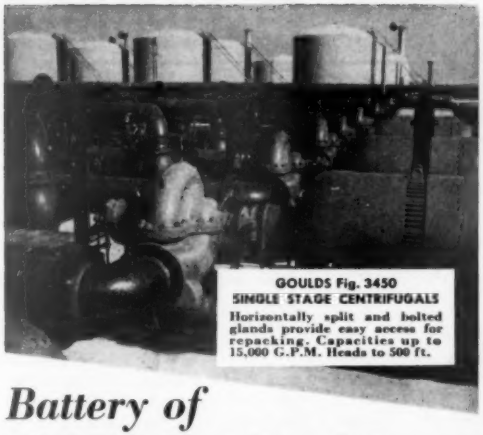
"FASTER from FOSTER"

STANDARD • MERCHANT
LAP WELD • SEAMLESS
BUTT WELD • SPIRAL WELD

Substantial stocks in 5 Foster Warehouses can fill most requirements. Call on FOSTER for all your pipe needs.

RAILS-TRACK EQUIPMENT • PILING • WIRE ROPE

L.B. FOSTER CO.
HOUSTON 2, TEX. · CHICAGO 4, ILL.
PITTSBURGH 30, PA. · NEW YORK 7, N.Y.



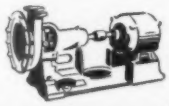
GOULDS Fig. 3450
SINGLE STAGE CENTRIFUGALS
Horizontally split and bolted glands provide easy access for repacking. Capacities up to 15,000 G.P.M. Heads to 500 ft.

Battery of GOULDS Centrifugal Pumps *gives dependable service*

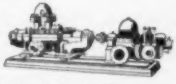
Here is a battery of Goulds 10" double suction, split case centrifugal pumps at work for a well-known oil company in the Lake Charles area. These Goulds and hundreds of others throughout the oil industry are giving heavy-duty, 24-hour-a-day, trouble-free service.

Oil men choose Goulds pumps for several reasons. First, they are low in cost. Second, they offer high efficiency pumping with relatively low power consumption. Third, their simple, sturdy construction assures long service life and low maintenance costs. These Goulds pumps offer other important advantages, too. Interchangeable parts permit reduced inventories. A wide range of capacities and heads affords versatile application. For complete information and specifications on the Goulds Fig. 3450 pumps shown above, write for Bulletins 721.1 and 721.2.

Other Outstanding GOULDS for the Oil Industry



GOULDS Fig. 3705
Stainless steel pump for handling acid and alkaline liquors. Capacities up to 600 G.P.M. Heads up to 160 ft.



GOULDS Fig. 3360
High pressure multistage centrifugal. Two hydraulic arrangements available.

GOULDS Fig. 1813
High-quality "New Pyramid" double-acting piston pumps. Six sizes. Capacity ranges from 7 to 58 G.P.M. Heads up to 580 ft.

Goulds PUMPS INC.
Seneca Falls New York

Federated first for CATHODIC PROTECTION...

FEDERATED ZINC ANODES

If your cathodic protection system is designed for zinc anodes, call Federated first.

Zinc anodes are available in standard lengths of three and five feet. They are cast from Special High Grade Electrolytic Zinc in shapes of 2 sq." and 4 sq." of cross-sectional area with full length chemically bonded steel core rod. Silver soldered connecting wires can be attached if desired.

If you are in doubt as to the proper applications for zinc anodes, Federated will send you a comprehensive report on "Zinc As A Galvanic Anode" prepared by Ebasco Services Inc. for the American Zinc Institute. If your protection system is designed for magnesium anodes ask for the Federated booklet, "Magnesium Anodes For Cathodic Protection." Use the coupon below for your free copies.

Federated first in the non-ferrous field FMD

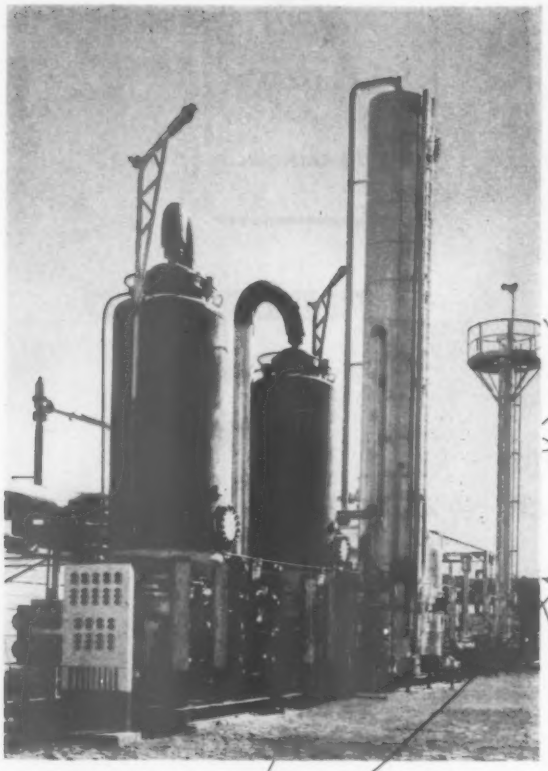
Federated Metals Division
AMERICAN SMELTING AND REFINING COMPANY,
120 BROADWAY, NEW YORK 5, N. Y.
ATTENTION: CORROSION ADVISORY SERVICE

Please send me FREE copy of ☐ "Zinc As A Galvanic Anode" ☐ "Magnesium Anodes For Cathodic Protection"

Name _____ Title _____

Company Address _____

City _____ Zone _____ State _____



PERCO*

CYCLOVERSION* AT PALESTINE, TEXAS

Inland Refining Company recently put this 850 barrel per day Cycloversion unit on stream reforming straight run gasoline.

Engineering by Grebe & Doremus Process Co., Houston, who partially shop fabricated this unit on three skids for more rapid installation.

Write us about Cycloversion for you.

Perco Division **PHILLIPS PETROLEUM COMPANY** *Bartlesville, Oklahoma*

*A SERVICE MARK

REFINING

A.I.Ch.E. Begins Research On Fractionator Efficiency

NEW YORK.—The American Institute of Chemical Engineers has launched a 5-year research program on plate efficiencies in fractionating towers.

This cooperative project, backed with $64,000 in contributions from numerous member companies, will be carried out at the University of Michigan, University of Delaware, and Polytechnic Institute of Brooklyn.

Basic investigations will be conducted on the fundamentals of tray efficiency both in fractionation and absorption. Later, tray design and column hydraulics will be studied. The project was organized by the institute's research committee.

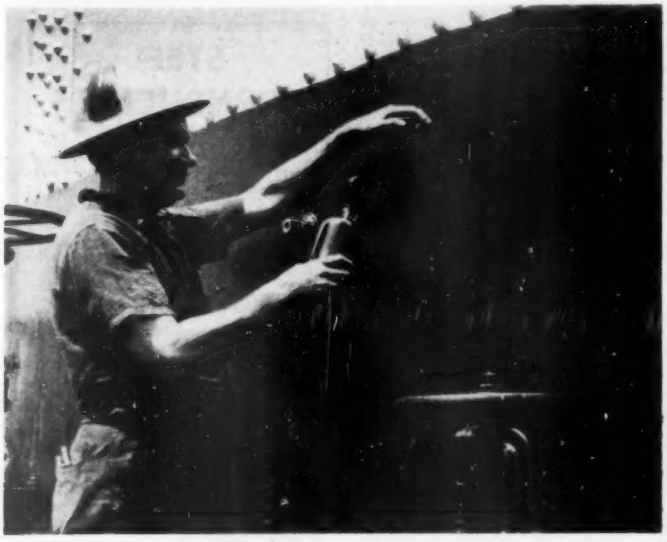
Companies in petroleum and related industries who contributed to the studies include: Ethyl Corp.; Fluor Corp., Ltd.; Gulf Research & Development Co.; Hydrocarbon Research, Inc.; M. W. Kellogg Co.; Lummus Co.; Ohio Oil Co.; Pure Oil Co.; Socony-Vacuum Laboratories; Standard Oil Co. (Ind.); Standard Oil Development Co.; Sun Oil Co.; Tide Water Associated Oil Co.; and Universal Oil Products Co.

$31,000,000 in Refining Facilities Granted Tax Aid

WASHINGTON.—More than $31,000,000 in new refinery projects have been approved for accelerated tax amortization by the Defense Production Administration.

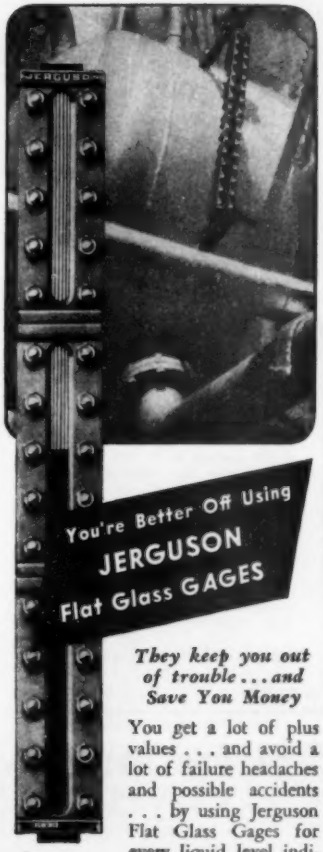
Largest of these is a $21,705,000 facility, unidentified as to type for security reasons, to be built near Baton Rouge by Esso Standard Oil Co. The project was certified for 65 per cent of $16,070,000, 40 per cent of $4,925,000, and 15 per cent of $710,000.

Certificates for refining projects also were granted Sunray Oil Co. (operator) for gasoline at Snyder, Tex., 65 per cent of $1,004,500; Aurora Gasoline Co. for gasoline at Elsie, Mich., 65 per cent of $850,000, 45 per cent of $178,000, and 15 per cent of $62,000;



Sampling the Billionth Barrel

John F. Realey, assistant roof inspector in the oil-movement and storage department at Esso Standard Oil Co.'s Bayway refinery, takes a sample from the tank containing the billionth barrel of oil to be processed at the Linden, N. J., plant. The billionth barrels was recorded more than 43 years after the Bayway installation processed its first barrel of crude in a run started on January 2, 1909. The advancement in rate of processing is revealed when record-scanning shows that the half-billion mark was reached in 1939—just under 31 years after the first one—while processing the second half billion took only 12 years and 10 months.



Jerguson Reflex Gage

They keep you out of trouble . . . and Save You Money

You get a lot of plus values . . . and avoid a lot of failure headaches and possible accidents . . . by using Jerguson Flat Glass Gages for every liquid level indicating use.

You get the kind of gages and valves you want to do YOUR JOB. Jerguson offers you the most complete line available. Jerguson offers you an engineering organization specializing in building special gages to meet problems.

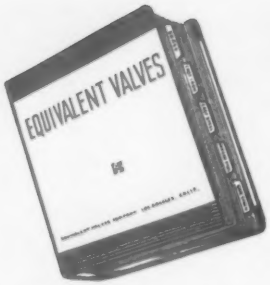
Jerguson Flat Glass Gages save money and labor. They are easy to install. They stand up . . . you don't have to keep servicing them or replacing the glass. They are available in a wide range of sizes, pressures, designs and materials; also with polished end stems to replace present tubular gages.

Write us about your problems or requirements.

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

JERGUSON GAGE & VALVE COMPANY
100 Fellsway, Somerville 45, Mass.
Representatives in Major Cities
Phone Listed Under JERGUSON
Jerguson Tran Gage & Valve Co. Ltd., London, Eng.



A MUST FOR EVERY VALVE BUYER

Slashes time spent on valve specifying and checking. Compares valves of 19 leading manufacturers. Over 50,000 postings in its 170 loose-leaf pages! Used by major companies throughout U.S.A.

SPECIAL OFFER—Now, revised edition just out. Price $25. Offered at $21.50 for *limited time* (Expires in 30 days). Every specifying engineer, every purchasing agent should have this manual. Like adding an extra man to your staff. We send on approval. Write NOW for full information.

EQUIVALENT VALVES COMPANY
5th Floor
115 West 7th St. Los Angeles 14, Calif

SAFETY-RELIEF VALVES
and
PRESSURE GAUGES
by
Lonergan
...A PIONEER...
are widely used in the
OIL and GAS INDUSTRY

A wide variety of both Valves and Gauges are designed and accurately built by Lonergan for every oil field, refinery and pipe line application. Send for our Valve catalog 800-V and our Gauge catalog 800-G.

J. E. LONERGAN CO.
• SINCE 1872 •
2ND and RACE STREETS
PHILA. 6, PA.
There's a Lonergan Distributor in your area.

Midland Cooperative Wholesale for gasoline at Cushing, Okla., 65 per cent of $2,496,056 and 45 per cent of $734,622; and Humble Oil & Refining Co. for propylene, butylenes and butanes at Baytown, Tex., 65 per cent of $3,650,000 and 50 per cent of $550,000.

Gulf Research Company Revamps Chemistry Division

PITTSBURGH.—Gulf Research & Development Co. has reorganized its chemistry division into two subgroups devoted to products and processes. The change has been made to improve the efficiency of research activities in the two fields.

The new product division, headed by Dr. H. A. Ambrose, will concentrate on the development of new products and the improvement of existing ones. It is divided into four sections concerning product development, analysis, entomology, and service and supply.

The process division consists of three primary sections. One, on refinery processes, will study refining methods and technology and will operate large-scale pilot plants. A new processes section will work on the development of new refining techniques. Reflecting a growing interest in petrochemicals, Gulf Research has set up a third, separate section to conduct further research in this rapidly expanding field. Dr. C. W. Montgomery heads the new process division, assisted by W. C. Offutt. Dr. Jerry McAfee, assistant director of research will supervise work in the two new research divisions and will coordinate their work with allied research conducted in other portions of the Gulf laboratories at Harmerville.

Refining Briefs

Western Petroleum Refiners Association will hold a regional technical-industrial relations meeting in Detroit, August 7-8. The 2-day meeting at the Book-Cadillac Hotel will be concerned with water pollution problems and sessions on industrial relations. A plant visit to the Aurora Gasoline Co. refinery in Detroit has been scheduled for Friday afternoon.

Jefferson Chemical Co., Inc., has announced that propylene carbonate is now available in pilot-plant quantities from its plant at Port Neches, Tex. The new petrochemical has possible applications as a hydraulic fluid, a solvent and selective solvent, a chemical intermediate, and as a hydroxypropylating agent. Recently, the company also announced pilot-plant production of ethylene carbonate.

Glove Buying Know-How... Pays You Dividends!

PIONEER
Stanzoils®

NL-14 Duplex. Lightweight, elastic knit lined, neoprene-coated. Non-slip fingers. Utmost comfort.

The *right* glove for every job pays off in:

★ More glove service at lower per-hour cost
★ Full protection for your workers
★ Fewer work stoppages and injury claims
★ More production through faster-working hands

Lack of glove protection costs you money—but so does loss of worker efficiency. No *one* glove is effective for *all* jobs in your plant. Get the best combination of protection *and* working speed. PIONEER's new catalog tells you how! *Advice is unbiased, for Stanzoils include all kinds of liquid-tight gloves:* all-neoprene, neoprene or vinyl-coated; 32 styles, weights, sizes, colors. Scientific selection boosts profitable production. Write for this helpful catalog today!

Industrial Products Division
The PIONEER Rubber Co.
683 Tiffin Road, Willard, Ohio
STANZOIL
30 Years

STEEL TURNBUCKLES

¼", ⅜", 1", 1¼" and 2" diameter carried in stock, in 6", 12", 18" and 24" length.

Black or Galvanized

Write or wire for prices and delivery.

NORRIS BROTHERS, INC.
Robinson, Illinois

M-SCOPE PIPE FINDER

MODEL AB
ONE MAN OPERATION
METAL CABINETS
HEAVY DUTY PERFORMANCE
ONLY
$149.50

FISHER RESEARCH LAB., Inc.
PALO ALTO CALIF.

Let Us Show You How

DESCO LUBRICANTS REDUCE PLUG VALVE Maintenance COSTS 1/3

Only 3 DESCO Standard Service Lubricants and 1 DESCO Special Lubricant are needed to service all the lubricated plug valves you have. With DESCO Lubricants you not only reduce your investment in lubricants but reduce the hazard of using the incorrect lubricant. And most important — they stand up where others fail — they save your valves!

FOR HYDROCABON SERVICE — two types.
#600 All-Purpose — —40° F. to 500°F.
#750 High Temperature — 400° F. to 900° F.

FOR ACIDS AND CAUSTICS — #400 — with a temperature range from 10° F. to 480° F.

FOR LPG SERVICE — #650 — A specially developed lubricant for LPG service from —50° F. to 150° F.

DESCO Lubricants are packed in convenient individual sticks in 6 sizes. 12 to 24 sticks to a carton. 6 cartons in a case. Write for catalog and prices.

10 TIMES FASTER LUBRICATION

With the DELTA High Pressure Gun, DELTA Fittings and DESCO Specialized Lubricants . . . . . you can lubricate 10 to 15 valves in the time usually required to service one with conventional jack screw.

The Only Complete Plug Valve Lubrication Company

2.

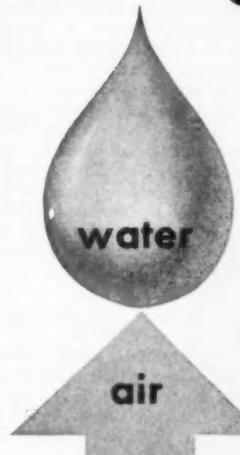
DELTA-DESCO SYSTEM

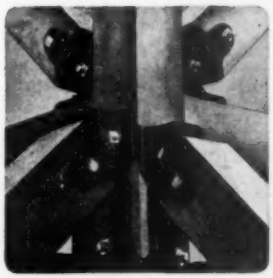
DELTA

ENGINEERING SALES CO.
806 Louisiana Ave. • Phone 5-2416
SHREVEPORT, LOUISIANA, U.S.A.
Sales Offices In All Principal Cities

greatest structural strength . . .

with WCEC *Patented* Cast Iron Timber Connectors

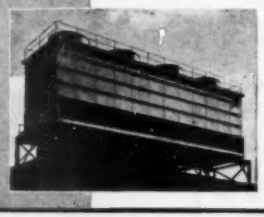




By use of WCEC connectors, the struts develop their strength as a column by direct bearing on the square end of the strut against a cast iron seat. The connectors spread the horizontal component of the stress in the strut over a large area of the vertical columns, to assure that the allowable resistance of the wood in compression perpendicular to the grain will not be exceeded. The vertical component of the stress is transferred to the vertical column in direct end grain bearing, through shear bars on the timber connector. These patented connectors develop the greatest structural strength of the timber joints, an accomplishment almost impossible to achieve by bolting alone. WCEC cooling towers directly in the path of hurricanes have withstood the test of extreme wind load without damage.

SEE OUR CATALOG IN SWEET'S FILE

TOWERS OF STRENGTH WCEC



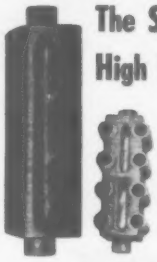
Typical Installation at Bloomingdale's, New York City. Other WCEC towers at Gimbel Brothers, Pittsburgh; Scruggs-Vandervoort-Barney, St. Louis; Sears-Roebuck, Chicago; J. C. Penney Co., St. Louis.

WATER COOLING EQUIPMENT COMPANY

MAIN OFFICE • New Hampshire Ave. and Weber Road • St. Louis 23, Mo.

Fabricating Plants: St. Louis, Mo. • Arcata, Calif. • Houston, Texas

REPRESENTATIVES IN TWENTY-EIGHT PRINCIPAL CITIES



The Safest High Pressure Gauge In The World

INFERNO

Gauge glass in Inferno gauges is 1" thick, specially tempered and heat treated. This glass is held in the gauge by equal pressure on both sides around the entire edge of the glass. The body is available in 3 different metals, and is machined from solid bar stock.

Sold direct or through your favorite supply house. Write for Bulletin 23-A.

The INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

GOLD SNATCH BLOCKS

SPLIT HOOK for FAST THREADING

Efficiency is the word for the GOLD SNATCH BLOCKS . . . a simple twist and the rope can be easily inserted. Close the block with another twist and it's ready to go! Easy on . . . Easy off! Saves time and money!

3 POPULAR SIZES
- 3,000 lbs. for ⅜" Rope.
- 5,000 lbs. for ½" Rope.
- 7,500 lbs. for ⅝" Rope.

Ask Your Jobber... or Write Direct

GOLD FOUNDRY & MACHINE WORKS
1618 S. Osage . . . Independence, Mo.

Among the Drilling Contractors

Pike to Extend Drilling To Rocky Mountain Area

Thomas P. Pike Drilling Co., Los Angeles, one of the larger Pacific Coast contracting companies, is planning to extend its activities to the Rocky Mountain region. Immediate plans call for moving two diesel-powered rotary rigs to that region to engage not only in contract drilling but also operations for the account of its affiliates, Christopher Oil Co. and Vega Corp. The move follows a recent, lengthy field survey in that region by Stanwood I. Williams, executive vice president, and H. G. Haney, vice president and general superintendent.

Rex Drilling Co., Shreveport, is drilling for Gulf Refining Co. at a projected 11,000-ft. Lower Cretaceous exploratory test located 1¾ miles southeast of Sandersville, Jones County, Mississippi. Location is for 1-F Jones County, in the C NW SW 16-19n-10w.

Cherokee Drilling Co. is rigging up for a wildcat test it will drill for the California Standard Co. in the Two Creeks area, 14 miles northwest of Virden, Manitoba, Canada. Location is in LSD 9, 22-12-27w1.

Rowland Drilling Co., Oklahoma City, is starting work on a new contract which it has with Indian Royalty Co. for a 7,300-ft. wildcat test, 1 Daykin, located in the SW SW SW 26-24n-7w, 7 miles northwest of Enid, in Garfield County, western Oklahoma. Objective is the second Wilcox sand.

New Company Formed For Williston Basin Drilling

Willingdon Drilling & Exploration Co., Inc., a Delaware corporation, is a newly formed, wholly owned subsidiary of Duke Petroleum Co., Ltd., of Calgary, Alberta, Canada, which will operate in Montana and North Dakota. Headquarters are located at Glendive, Montana. Officers are Harvey L. Harley, president; T. R. King, secretary; and L. P. Chandler, director.

The new company has acquired a new heavy-duty, rotary rig, and already has contracts with California Canadian Oil Corp., for drilling in the Cedar Creek Anticline area, in Montana, where operations are due to be started by August 1.

Fortenberry Drilling Co., Natchez, Miss., has contracted with C. L. Smith of Grove Hill, Ala., and C. S. McKendrick of New Orleans for a wildcat test to be drilled in southeastern Walton County, in the coastal area of the northwestern Florida Panhandle. Location, in 22-1n-17w, is on land of the Walton

On the floor of a rotary rig Fred C. Summers Drilling Co., Seminole, Okla., is operating for Provincial Oil Co. at an extension location for the St. Louis field, a quarter mile south of Pearson, Pottawatomie County, Oklahoma. Left to right: Herman Young, Leo Scott, Earl Young, and R. M. Cooper (driller), rig crew, and Bob Parkhurst, Mud Control Laboratories, and J. B. Kendall, Eastman Oil Well Survey Co.

NEW PERFORMANCE!

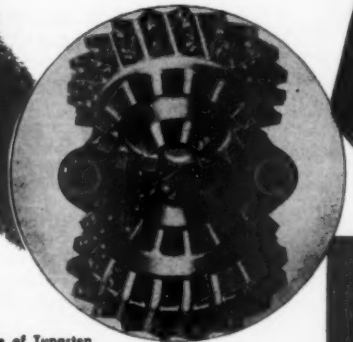
NEW DRILLING ECONOMY

with the new "2-CUTTER" Integral JET ROCK BIT pioneered by Globe

One of the most important features of Globe "Jet Drilling" is that the cutters always work on a clean, bottom-hole surface . . . even smallest cuttings are removed instantly. Sharp, rugged teeth take a full bite of formation with every turn of the drill string, resulting in a new kind of drilling performance that offers operators new economy in oil well drilling.

Although only recently announced, Globe "2-Cutter" Integral Jet Rock Bits have been thoroughly field tested with the cooperation of leading oil companies and drilling contractors . . . field tested for your assurance of greatest drilling efficiency.

Globe Jet Bits are now available in all popular sizes from 8½" to 15" in types SS2C, S2C, M2C, MH2C, and H2C.



Jet Nozzles are made of Tungsten Carbide to hold up under highest mud pressures . . . 9/16", 5/8", 11/16", and 3/4" diameters.

GLOBE

GLOBE OIL TOOLS

Branches In: BAKERSFIELD, AND VENTURA, CALIFORNIA • CASPER, WYOMING • DALLAS, HOUSTON, ODESSA AND TYLER, TEXAS • DUNCAN, OKLAHOMA • LAKE CHARLES, LOUISIANA.

Main Office and Plant: LOS NIETOS, CALIFORNIA

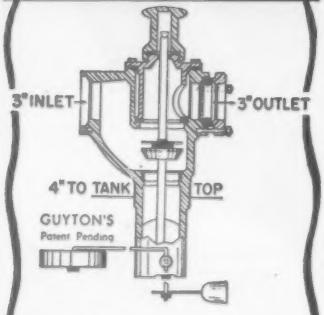
ACME
OIL TOOL COMPANY
• COMPETENT OPERATORS
• ROTARY FISHING TOOL SERVICE
• SPANG CABLE TOOLS • DRILL PIPE
• BLOW OUT PREVENTERS • RENTALS
• COMPLETE OIL FIELD MACHINE SHOP

Division of Acme Oil Tool Company at Great Bend, Kansas.

MFG. RENTALS ACME REPAIRS INC.

CALL:
OKLAHOMA CITY
MEtrose 8-1556
GREAT BEND
7810-7819

THE AUTOMATIC STOCK TANK ROUTING VALVE
Isn't NEW Any More!



—it is field proven by many major companies who are realizing a saving of time and money on Stock Tank hookups. *Send for bulletin with list of companies now using this valve.*

MURDOCK
TANK & MFG. CO.
TULSA, OKLAHOMA

Land & Timber Co. Proposed depth is 5,000 ft.

Southern Production Co., Inc., Shreveport, has contracted for another Smackover lime test, the second, which Lion Oil Co. will drill in Rankin County, Mississippi. The new operation is 1 Delso, C NE SE 17-8n-5e, 2½ miles south of Ratliff, and 8 miles northeast of the first test, 2 Denkman, recently abandoned at a total depth of approximately 15,800 ft.

Crow Drilling Co., Shreveport, has moved a rig to a wildcat location a mile northwest of Jeanette, Adams County, Mississippi, where it will drill a scheduled 6,800-ft. Wilcox test for John S. Callon at 1 Emery, in 35-6n-1w.

Fleet Drilling Co., Ada, Okla., has a new operation under way for Ryan Oil Co. in the Northwest Iconium area, in eastern Logan County, Oklahoma. It is 1 Humphries, in the SW NE SE 34-17n-1e. Objective is the Wilcox sand, expected around 5,300 ft. Location is a half mile from production.

Al Buchanan Drilling Co., San Antonio, will be the contractor on an Ellenburger exploratory test which Standard Oil Co. of Texas and the Chicago Corp., joint operators, have projected for the southeast side of the Smith-Spraberry field, Dawson County, West Texas. Location is for 4-1 Smith, in 34-C41-PSL Survey. Objective is expected at 11,500 ft.

Lyle Cashion Co., Jackson, Miss., contracting for Kirby Petroleum Co., Houston, has a new wildcat operation under way 8 miles northeast of Liberty, Amite County, Mississippi. It is at 1 Wells, in 23-3n-5e. Hole is scheduled to be carried to the Wilcox, expected at approximately 8,000 ft.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area—	Week ended 7-21-52	Change week ended 7-14-52	Change week ended 7-23-51
Gulf Coast	523	−41	− 81
N. & W. Tex.-N. M.	804	−26	−125
Ark.-N. La.-E. Tex.	138	− 6	− 26
Oklahoma	298	+10	+ 8
Kans.-S. Nebraska	146	− 4	− 13
Illinois-Eastern	146	− 9	− 20
Rocky Mountains	229	− 8	+ 64
Pacific Coast	161	− 1	+ 8
Total U. S.	2,445	−85	−185
Western Canada	166	− 4	+ 33
Total	2,611	−89	−152

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the North and West Texas-New Mexico and Oklahoma-Kansas areas are shown on pages 424 and 425.

Trans-Tex Drilling Co., Longview, Tex., is drilling on a contract with Cities Service Oil Co. at a wildcat location 1½ miles southwest of Crow, in northern Smith County, eastern Texas. The test, 1 G. G. Wright, is expected to be carried to 6,000 ft.

Hilton Drilling Co., Great Bend, Kans., is drilling for Northern Pump Co. at a wildcat location 5 miles southeast of the Hungry Hollow pool in northeastern Rush County, Kansas. Location is in the NW SE NE 11-16s-17w on the operator's Stegman lease.

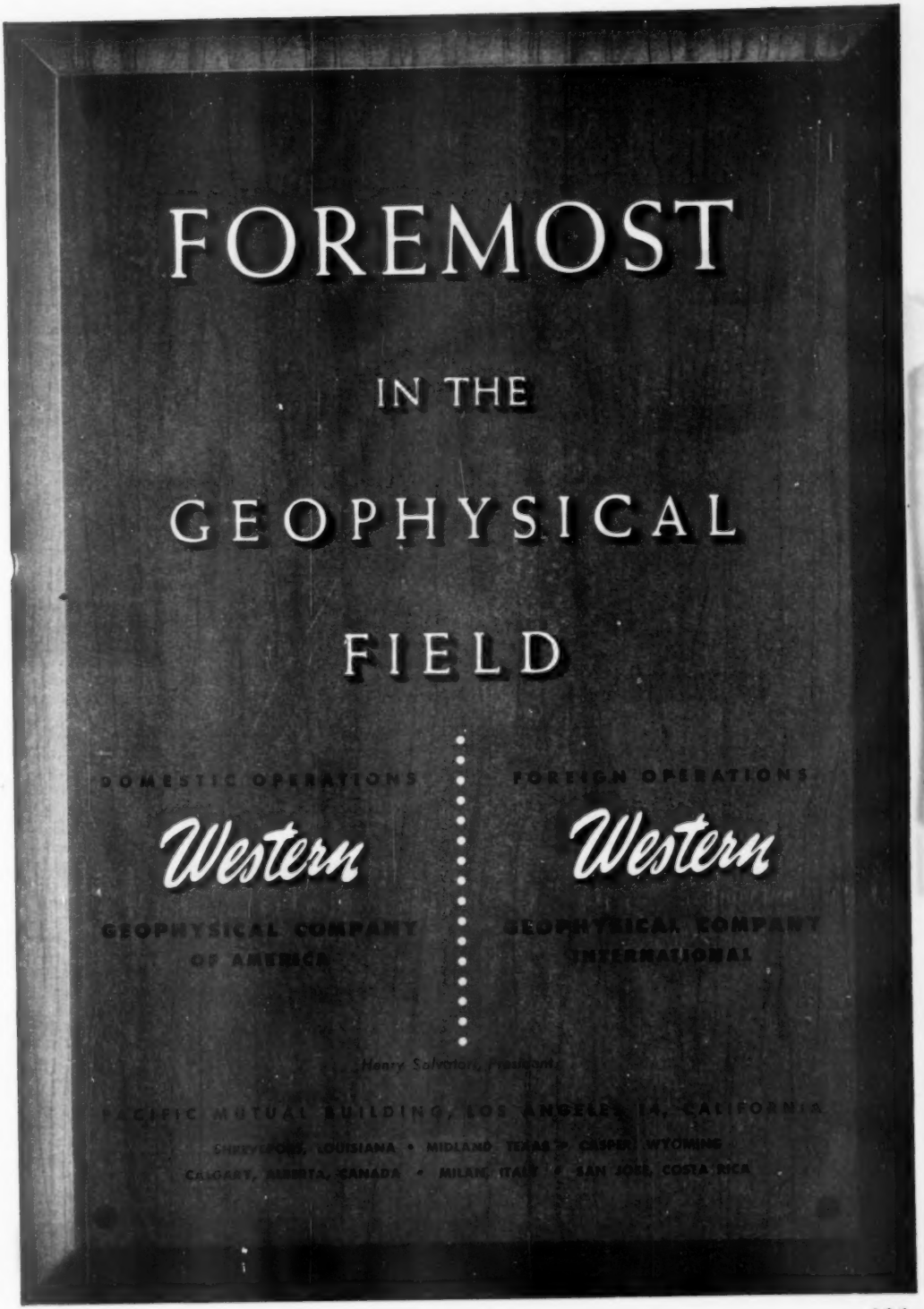
When You Need Efficiency in Swabbing

You Can Depend on Bell Swabs

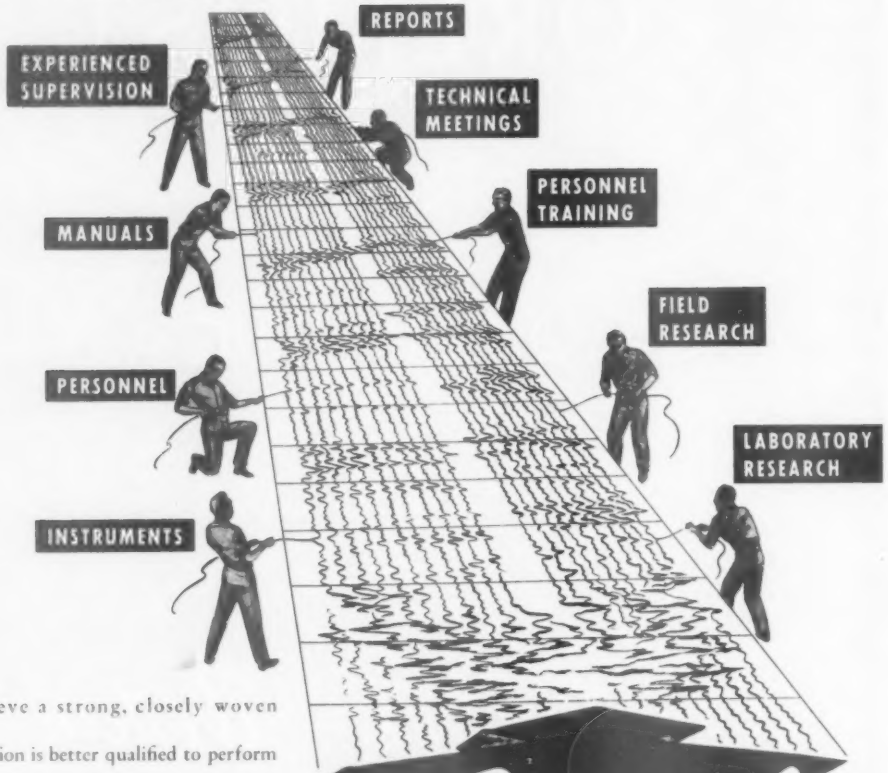
Whether swabbing
. . . oil
. . . water
. . . or mud . . .
you can depend on BELL'S DESIGN and QUALITY for
MAXIMUM RECOVERY

BELL RUBBER COMPANY
• Phone EDgemont 2-1281
• 6001 W. Jefferson
• P. O. Box 4426
• DALLAS 11, TEXAS

Standco
NO-SMOKE
STANDCO BRAKE LINING
Stands the gaff and gets the job done without scoring brake rims. See pages 3608-3613, Composite Catalog.
Standco Brake Lining Co.
HOUSTON


FOREMOST
IN THE
GEOPHYSICAL
FIELD
DOMESTIC OPERATIONS
Western
GEOPHYSICAL COMPANY
OF AMERICA
FOREIGN OPERATIONS
Western
GEOPHYSICAL COMPANY
INTERNATIONAL
Henry Salvatori, President
PACIFIC MUTUAL BUILDING, LOS ANGELES 14, CALIFORNIA
SHREVEPORT, LOUISIANA • MIDLAND, TEXAS • CASPER, WYOMING
CALGARY, ALBERTA, CANADA • MILAN, ITALY • SAN JOSE, COSTA RICA

closely woven to provide a better "PICTURE"



We believe a strong, closely woven organization is better qualified to perform Seismic Surveys. Give us an opportunity to demonstrate the extra value of putting National's *extra* rounded out organization to work for you!

Call your nearest NATIONAL office – or DIxon-2671, Dallas, Texas.

National GEOPHYSICAL COMPANY, INC.

MIDLAND DALLAS HOUSTON

CALGARY, CANADA

LEADING THE FIELD OF SEISMIC EXPLORATION

First-Half Exploration

RESULTS of exploratory drilling during the first 6 months of 1952 have led to intensified interest in several provinces which had received black eyes in the past—rank wildcats were completed as oil wells, giving credence to the statements of those who say the United States is not running out of oil.

It is generally agreed that wildcat prospects recognized as "first class" are few and far between, and that the hunt for any kind of prospect grows increasingly more difficult. This gloomy picture hasn't developed since the first of the year—the outlook then was no better than it is right now—but, consider what's happened in just 6 months:

Out in California, Richfield Oil Corp. discovered Eocene oil in a deeper-pool test at the southern tip of San Joaquin Valley (A on map). The big well gave new life to the listless hunt for Eocene production along the entire western edge of the valley, where numerous areas of Eocene (especially deeper sands) remain to be tested.

Of the many new pools found in the intermontane basins of the Rocky Mountains, one discovery stands out because of its distance from production. McDermott's wildcat (B on map), just a few miles south of the Montana line on the western edge of the Powder River basin in Wyoming, found Cretaceous-Shannon oil 110 miles north of Sussex-Meadow Creek area. The big gap in Cretaceous sand production established by this wildcat is currently attracting considerable exploratory interest.

Discoveries are now stretched out for 55 miles along the Nesson anticline in North Dakota and for 160 miles in eastern Montana. The past 6 months saw the completion of Amerada Petroleum Corp. 1 Bakken (C on map), the wildcat which proved the Madison productive on the Nesson anticline and opened a sizable pool 15 miles north of the first North Dakota oil well.

Down in the northwestern end of the Anadarko basin, several wildcats were completed as producers to bring

this wide-open area into the active exploration picture. Several pays have been proven and the hope for finding the "mother lode" is growing. Carter Oil Co. 1 Sharp (D on map) in Beaver County, Oklahoma, opened a promising pool and rank wildcats in the Texas Panhandle and in Major and Harper counties, Oklahoma, have added to the optimistic outlook for this area.

The Delaware basin (E on map), long recognized as an area which may someday rival the Midland basin, was the scene of considerable excitement. Grisham 1 Grisham and Phillips Petroleum Co. 1 Glenna, wildcats 135 miles apart, found big gas in the Devonian and Ellenburger, respectively.

Up in the Michigan basin, 4 years without a significant discovery, interest was developed in the potentialities of the Silurian-Niagaran rocks around the rim of the basin as a result of several widely separated strikes. The first of the series was Brazos Oil & Gas Co. 1-HE State-Chester (F on map), which was completed as an oil well.

A result of the continuing search for gas in the old eastern fields were discoveries in Ohio of Devonian-Oriskany gas along what may develop into a narrow 90-mile-long trend (G on map).

The wildcat that stirred up exploratory activity in the biggest potential area was Humble Oil & Refining Co.'s wildcat in southwestern Alabama (H on map). This flowing discovery revived dying interest in eastern Alabama, productionless Georgia, and all of Florida.

The long-range potentialities for developing more and more production in this country must not be judged by the difficulties encountered when combing a limited area for oil.

Philip C. Ingalls

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

UTAH . . . Two possible discoveries were reported in the Uinta basin of Utah, where The California Co. has tested oil from 1 Unit, C NE NE 24-6s-4w in the Antelope Creek area of Duchesne County, and 3 Unit, W½ NW NE 10-6s-20e between Roosevelt and Red Wash fields.

COLORADO . . . Continental Oil Co. has made location for a Kiowa County wildcat, which will be a deep test along the southeast flank of the Denver-Julesburg basin, reflecting new interest in programs announced for the Las Animas arch on the southeast flank of the basin and the Chadron arch in Nebraska along the northern and northeastern flank of the basin.

NORTH DAKOTA . . . Amerada Petroleum Corp. made locations for three Beaver Lodge field wells, a Beaver Lodge extension, and two extensions to the Tioga area discovery. Amerada has completed 1 North Dakota "C" for 446 bbl. of oil through ¼ and 12/64-in. choke. Important test of Amerada's wildcat between the Beaver Lodge and Croff areas is being run at 1 North Dakota "D" in the Charlson area, McKenzie County.

WEST TEXAS . . . Hanley Co. 1 Headlee, possible lower Wolfcamp discovery in northeast Ector County, was out of the pay on second deeper test at 10,143-72 ft. Estimates were up to 50 bbl. hourly on first test at 10,085-10,143 ft.

WHY INSULATE YOUR CONDENSER TUBES?

You may be doing just that if your plans don't include CHLORINATION EQUIPMENT for slime control by WALLACE & TIERNAN.

Chlorination equipment because it controls slime that *grows* on the walls of condenser tubes not protected against it. Enough of the growth eventually seriously reduces heat transfer efficiency — actually *insulates* your steam from the cooling water. Back pressures go up, production drops, operating and maintenance costs rise, and eventual shut-down becomes necessary for regular clean-out periods.

Wallace & Tiernan equipment because it is versatile, sturdy and dependable — proven by thousands of successful installations, vouched for by satisfied users everywhere-and because there's a Wallace & Tiernan chlorinator for every job. Write today for information on how Wallace & Tiernan chlorination may help you solve *your* slime problem.

NO WATER IS SLIME-FREE

regardless of the source. Chlorination helps reduce slime in process or cooling water.

CD-37

WALLACE & TIERNAN
COMPANY, INC.
CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

Permian Basin

Wolfcamp Strike Seen For Ector County

MIDLAND.—A possible Wolfcamp discovery, according to early identification, was seen at Hanley Co. 1 Headlee, Ector County wildcat 8 miles northeast of Odessa.

First drill-stem test in the lower zones, from 10,085-143 ft., had gas in 5 minutes and flowing oil in 44 minutes estimated at the rate of 20-25 bbl. hourly. It flowed into pits for 15 minutes and was shut in and drilled to 10,173 ft. for a second test. Oil in the drill pipe unloaded while coming out of the hole and there was no water.

V. A. Brill 1 Fasken, northwest of the 1 Headlee, was drill-stem testing from 8,643-67 ft., on which gas had surfaced in 4 minutes and fluid in 2 hours and 26 minutes.

Brill 1 Ratliff had total depth at 13,874 ft. and was running electrical surveys. Top of Ellenburger was 13,644 ft., on elevation of 2,991 ft.

In southwest Ector County, J. D. Wrather, Jr. 1 Hall was pulling pipe after testing for 3 hours from 7,498-7,640 ft.

Ector County gained a new deep wildcat at Forest Oil Corp. 1-L TXL, in 31-45-T1N-T&P, 3 miles east of Goldsmith and 1 location northwest of the company's 1 Continental-Wight, dry hole at 7,257 ft. Projected depth on the new operation was 12,500 ft., expected to test the Ellenburger.

In Glasscock County, Seaboard Oil Co. of Delaware and Texas Pacific Coal & Oil Co. 1 Bishop flowed an average of 15 bbl. of oil hourly on a 14-hour drill-stem test after acid treatment of a Permian limestone between 6,131-6,211 ft., then made 24-hour potential test of 412 bbl. of 39°-gravity oil through 24/64-in. choke. Completion gage was taken on the same section above. The discovery is 14 miles southeast of Garden City.

Tucker Drilling Co. was moving in rotary to clean out to 5,000 ft. at the old Hiawatha Oil & Gas Co. 1 Jeff Harkey, Schleicher County wildcat which was dry in the Ellenburger at 6,183 ft. Tests in the Canyon sand were to be made around 4,832-82 ft., where heavily oil-cut mud had been developed on drill-stem tests. Location is northeast of Eldorado in 77-H8-GH&SA.

In Yoakum County, The Texas Co. 1 Tom Cobb, 224-D-John Gibson Survey, developed 1,350 ft. of gas, 1,530 ft. of water blanket cut with oil and gas, 90 ft. of 45°-gravity oil, and 2,430 ft. of oil and gas-cut salt water. The test was run from 12,140-168 ft. and open 2 hours. Outside sources called top of the Devonian at 12,136 ft. Location is 13 miles northwest of Plains.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Andrews County: Jackson, Douglas & Whitaker, Ltd., 1 Lineberry, 16-A26-PSL, TD 4,718 ft., elev. 3,372 ft., pay 4,589 ft., IP pumped 106 bbl. 31°-gravity oil.

Midland County: Superior Oil Co. 4-16 J. D. Windham, 16-40-T4S-T&P, TD 13,245 ft., elev. 2,856 ft., Devonian 11,698 ft., top Devonian pay 12,353 ft., IP 147 bbl. 48°-gravity oil, 16/64-in. choke, TP 140 psi., GOR 1,483 ft.; Ellenburger 13,106 ft., pay 13,154 ft., IP natural 475 bbl. 53°-gravity oil, 10/64-in. choke, TP 2,100 psi., GOR 1,183 cu. ft.

Runnels County: Miami Operating Co. 1 Adkins-Henson, Blk. 15, A. Losoya Sur. 515, TD 3,842 ft., elev. 1,866 ft., perforated 3,612-16 ft., IP 399 bbl. 43°-

gravity oil, TP 195 psi., GOR 800 cu. ft.

Tom Green County: J. K. Dorrance Trustee and American Republics Corp. 1-A Atkinson, 5-20-H&TC, TD 7,150 ft., elev. estimated 2,188 ft., Palo Pinto 5,540 ft., pay 5,552 ft., IP 198 bbl. 43°-gravity oil, ¼-in. choke, TP 100-225 psi., GOR 550 cu. ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Crockett County: Delta Gulf Drilling Co. 1 P. T. Robinson, 135-O-GH&SA, dry, TD 12,022 ft., elev. 2,051 ft., Strawn 11,837 ft.

Midland County: H. Mills and George Rochr Jr. 1 Wilson Bryant, 10-39-T4S-T&P, dry, TD 8,591 ft., elev. 2,733 ft., Spraberry 7,670 ft.

Runnels County: Joe P. Harris 1 Mrs. Lea Tinkle, J. C. McKean Sur., dry, TD 4,491 ft.

Sutton County: Woodward & Co. 1 Stella Lloyd, 23-K-GH&SA, dry, TD 5,200 ft., Strawn 4,550 ft., Ellenburger 5,040 ft.

Tom Green County: Signal Oil & Gas Co. 1-A Schulkey, W. Schirmacher Sur. 762, A-1,911, dry, TD 390 ft.

Winkler County: Humble Oil & Refining Co. 2-B Evans, 46-73-PSL, dry, TD 9,880 ft., elev. 3,206 ft., Mississippian 8,618 ft., Devonian 9,485 ft.

TEXAS PANHANDLE

Standard Oil Co. of Texas 1 Adams, discovery southeast of Floydada, prepared to complete after extensive tests. Pump was being rigged up after the well was swabbed and flowed for 191 bbl. of oil a day.

In Hartley County, Hunt Oil Co. 1 Finch, 1 mile southeast of Channing, had total depth at 5,400 ft. and had lost circulation. Kerr-McGee Oil Industries, Inc. 1 Berneta was drilling at 6,135 ft. Texas Gulf Producing Co. 1 Texas Gulf Matador, west of Channing, was drilling at 4,010 ft.

In Roberts County, Cities Service Oil Co. 1 Theis, deep wildcat 15 miles northwest of Pampa, was drilling limestone at 11,005 ft. Only formation top reported was the Mississippian at 8,898 ft. on elevation of 2,891 ft.

Gulf Oil Corp. 1 Haggard, west of Miami, was coring at 7,598 ft.

H. L. Hunt 1 Bivins, 2 miles north of Tulia in Swisher County, was down for repairs with total depth at 8,330 ft.

TEXAS PANHANDLE (DISTRICT 10) SUCCESSFUL WILDCATS

Gray County: Phillips Petroleum Co. 1 Hobart Ranch, 26-3-I&GN, 7 miles NE Pampa, TD 10,001 ft., elev. 3,154 ft., PB 8,726 ft., pay 8,364-74 ft., IP 21 bbl. oil, 3,250,000 cu. ft. of gas.

T. J. Wagner 1 Rice, 32-4-A. D. Hieman Sur., 3 miles NW McLean, TD 2,310 ft., elev. 2,814 ft., IP 520,000 cu. ft. of gas, RP 420 psi.

SOUTHEAST NEW MEXICO

Amerada Petroleum Corp. will complete its 1-MA State as a dual completion from the Devonian and the Wolfcamp. Potential of 812 bbl. of oil a day through ¾-in. choke has been made from the lower formation, through perforations at 10,450-500 ft. Wolfcamp perforations were to be made at 8,150-95 ft. The 1-MA State is the second well in a new field.

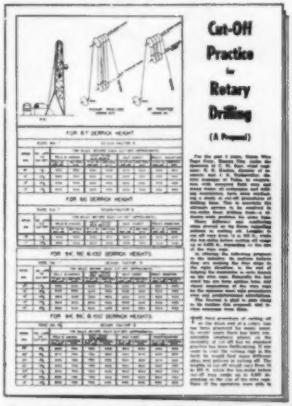
Magnolia Petroleum Co. 1 Black, depleted discovery drilled deeper, has been abandoned at 13,763 ft., in the Devonian.

New exploration included Lawson Oil Corp. 4 State, 14-13s-33e, to 12,000 ft., 3½ miles south of the Hightower area and to start immediately. W. D. McBee 3-A State,

Mail Coupon for Yours Today... It's FREE!

Drillers—here is an easy, surer way to establish the correct time to cut off drilling lines. When you know this, you can prevent the overloading that reduces the ton-mileage a line gives you. And, you can more often avoid the line breaks that result in costly fishing operations.

The Union Ton-Mile Indicator is easy to use. With it you get a Union Log Book to help you keep your well records. To measure ton-mileage, all you do is set the figures from your log book on the indicator and read the answer. All the complicated figuring is done for you. Mail the coupon below to have yours delivered and demonstrated to you.



Send Coupon For Reprint of Above Oil Journal Article

The information in this article is based upon a 3 year research study covering 4 major oil regions. It discloses the waste in haphazard practices and guides drillers in setting up Definite Cut-off Procedure which will result in many more ton miles of service and save money on wire rope.

USE Tuffy® ROTARY LINES

They employ a unique construction and special steels to provide extra resistance to abrasion, drum crushing, shock loads and internal friction. Tuffy *Jackknife* Rotary Line is specially designed to move at higher speeds over the smaller sheaves and drums of the *Jackknife* rig. Tuffy *Standard* Rotary Line is designed for *Standard* rigs and for deeper drilling on *Jackknife* rigs. They are easy to order. Just specify Tuffy *Standard* Rotary Line or *Jackknife* Rotary Line, the length and the size. No complicated specifications.

union Wire Rope corporation

Gentlemen:
☐ Please have your field man deliver my Union Wire Ton-Mile Indicator and explain its use.
☐ Send reprint of Cut-off Proposal.

UNION WIRE ROPE CORPORATION
2102 Manchester Ave. Kansas City 3, Mo.

Firm Name.....
Address.....
City..... Zone..... State.....

There is good reason why

~~58~~ 60 DIFFERENT COMPANIES HAVE PURCHASED MORE THAN ~~100~~ 130 SETS OF SIE SEISMOGRAPH INSTRUMENTS IN THE PAST FIVE YEARS

Your business is finding oil. Our business is instrumentation. It is up to us to provide you with the best instruments money can buy. Therefore our entire efforts and facilities are concentrated on the necessary RESEARCH, PRODUCTION DESIGN, MANUFACTURING TECHNIQUES and SERVICE PROGRAM to supply you with fine Seismograph Instruments and associated equipment.

This is why 60 different companies have purchased over 130 sets of SIE Seismograph Instruments in the last five years. They have found that it pays to let SIE be their Geophysical Laboratory.

SIE

SOUTHWESTERN INDUSTRIAL ELECTRONICS CO.

2831 Post Oak Road
HOUSTON, TEXAS, U. S. A.

434 7th Ave. East
CALGARY, ALBERTA, CANADA

12-17s-36e, on the southwest side of Lovington field where production is San Andres, was projected to 8,400 ft. Eddy County gained a shallow test at Buck Jones Drilling Co. 1 Gates, 29-26s-37e, which will test to 2,500 ft.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Lea County: DeKalb Agricultural Association and Magnolia Petroleum Co. 1 Nancy Stovall, 8-20s-38e, dry, TD 9,938 ft., elev. 3,576 ft. (base) Pennsylvanian 7,910 ft., Devonian 8,113 ft., Montoya 8,570 ft., McKee 9,840 ft.

Southwest Texas

Carrizo Discovery Reported In Atascosa County

CORPUS CHRISTI.—Sid Katz of San Antonio had an Atascosa County Carrizo discovery and has started another wildcat to the south about 7 miles southeast of Pleasanton. The Katz discovery is the 1 C. T. Troell, 4 miles southeast of production and about midway between Imogene and East Imgoene fields. On a 45-minute drill-stem test at 1,896-99 ft., on ¼-in. choke, there was strong blow throughout and recovery of 800 ft. of pipe-line oil and 20 ft. of oil-cut mud. Initial bottom-hole flowing pressure was 70 psi. This is one of the best Carrizo tests made in the area, observers said. Location is in the F. M. Mansfield Survey 6, A-1159.

W. C. McBride, Inc. has announced location of an offset to a recent Goliad County dual oil-distillate discovery between Weesache and Gottschalt fields in an effort to find production in the Fannin area of the County. McBride will drill an 8,000 ft. well at the 1 Nancy Jane Busby, 2 miles west of the town of Weesache. Location is in the Graviel Casias Survey, A-95. Both Jackson and Slick sands will be cored.

With the completion of the 66-2 Aransas State Tract 66, Sun Oil Co. has extended Lamar field production 1½ miles to the southwest. The 66-2 Aransas State Tract 66 has been completed for 175.03 bbl. of 38.4°-gravity oil from perforations 7,290-7,314 ft. Hole is bottomed at 7,323 ft. and 5½-in. casing is cemented to 7,323 ft. Location is on the Subdivision of Aransas Bay State Tract 66, 6,300 ft. northwest of Sun 67-1 Aransas State Tract 67, a gas well. Otic S. Bowers of Corpus Christi has announced location for the 1 Dr. John R. Thomas, 8,500-ft. wildcat, 2 miles north of Fulton in Aransas County. Location is on the Aransas City Subdivision, Lot 21.

Humble Oil & Refining Co. A-14 King Ranch-Tijerina, on the Kleberg County side of Tijerina-Canales Blucher field, flowed 153.01 bbl. of 42°-gravity oil on potential test through ¼-in. choke, under 1,700 psi. tubing pressure. Perforations, with 24 shots, were at 7,520-45 ft. and gas-oil ratio was 840 to 1.

Union Producing Co. 1 C. H. Swallow is a gas discovery wildcat, 4½ miles north of Donna in Hidalgo County. The new discovery was completed with calculated open flow potential of 19,000,000 cu. ft. of gas per day plus 5½ bbl. of distillate per M.c.f. of gas. Hole was drilled to a total depth of 11,286 ft. and plugged back to 8,450 ft. with 7-in. production string cemented to 8,555 ft. Production is from perforations at 8,248-68 ft. Location is in the Lino Cavazos Survey, A-57.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Aransas County: Sun Oil Co. 66-2 Aransas St. Tr. 66, S/D Aransas Bay St. Tr. 66, TD 7,326 ft., perf. 7,292-7,314 ft., IPF 175.03 bbl. oil per day, 9/64-in. choke, gas-oil ratio 868-1, 38.4°-gravity oil.

Hidalgo County: Union Producing Co. 1 C. H. Swallow, Lino Cavazos, A-57, TD 11,286 ft., perf. 8,248-68 ft., IP 19,000,000 cu. ft. of gas per day plus 5½ bbl. distillate per million.

Webb County: Bright & Schiff 1 J. C. Walker, Jose Borrego Grant V, TD 1,674 ft., IP 60.5 bbl. of 32°-gravity oil daily, gas-oil ratio 398-1. Gutierrez (Rosenburg sand) field.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Aransas County: Humble Oil & Refining Co. 1 St. Tr. 116 Aransas Bay, Aransas Bay Tr. 116, dry, TD 10,065 ft.

Phillips Petroleum Co. 1 Lamar-Preston Paul et al, M. Hunt Sur., A-79, dry, TD 10,755 ft.

Duval County: M. Clay Chiles 1 Dagmar-Gruy Cole et al, J. Poitevent Sur. 1953, dry, TD 4,910 ft.

Frio County: Alaska SS Co. & R. L. Kirkwood 2 Dillard & Nixon, T. P. Lenoir Sur., dry, 5,202 ft.

Jim Hogg County: Sinclair Oil & Gas Co. 2 Aurora G. Gallagher, Rafael de la Pena Sur., A-245, dry, TD 3,951 ft.

Stice Production Co. 1 Silver Lake Ranches, Inc., Diego Hinojosa Grant, A-357 dry, TD 4,365 ft.

Jim Wells County: Alex W. Head & John L. Welch, Jr. 1 Robert Adams, Los

"NO MATTER HOW YOU LOOK AT IT, McKISSICK BUILDS A BETTER BLOCK FOR EVERY PURPOSE."
TYPE CP
TRAVELING BLOCKS
ARE FULLY GUARDED for Safety
They're RUGGED, with Hy-Lead bearings, large diameter center pins, alloy steel flame hardened sheaves, all steel construction.
They're COMPACT . . . Short Overall Length . . . may be directly connected to most popular hooks.
They're ECONOMICAL in cost and operation.
Write for catalog.
McKISSICK
McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

It's the "follow-through" that counts

With peak work cycles becoming more crucial by the day throughout your operations, Twin Disc is all the more aware that *supplying* industry with high-performance Friction and Hydraulic Drives is only half the picture.

Today, it's the follow-through that counts—and Twin Disc assures that vital follow-through with the fastest, largest and most thorough Repair and Parts Service of any manufacturer of industrial friction and hydraulic drives.

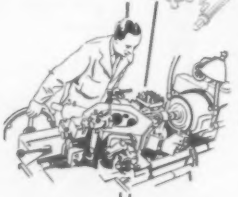
68

To keep your equipment rolling, Twin Disc now has:

SIXTY Parts Stations and EIGHT Factory Branches, fully staffed by experts ready to provide efficient service and to train your own service crews;

$3¼ million inventory of repair parts and complete replacement units; distributed at 68 Strategic locations in every industrial area—throughout the Nation.

PRODUCTION schedule on service parts closely geared to requirements from the field.



Built for a long life . . . Backed for a lifetime

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin · HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND · DALLAS · DETROIT · LOS ANGELES · NEWARK · NEW ORLEANS · SEATTLE · TULSA

Presnos de Arriba Grant, A-148, dry, TD 5,512 ft.

McMullen County: Phillips Petroleum Co. 1-A Washburn, BS&F Sur., Sec. 15, dry, TD 16,510 ft.

Nueces County: Delhi Oil Corp. 1 Wm. Schroeder, O. B. Carver Tr., dry, TD 5,261 ft.

Tri-Mark Oil Co. 1 Walter Nesloney, O. B. Carvier Tr., dry, TD 5,729 ft.

Starr County: J. Arthur Lundell 2 A. A. Guerra Trustee, Por. 73, Share 1-C, dry, TD 1,347 ft.

Webb County: American Liberty Oil Co. and Johnson Cone 1 O. G. Kirkpatrick, Sur. 116, Blk. 1, A-2,330, dry, TD 8,914 ft.

Harold K. Boysen 1 V. L. Puig, Albercosa Grant, Edington S/D Blk. 105, dry, TD 1,946 ft.

Louisiana-Ark.

Rapides Wilcox Discovery Completed Near Melder

SHREVEPORT.—The California Co. has completed 1 Long Bell Petroleum Co., Inc., 1,500 ft. from north line, 1,650 ft. from west line in Section X 9-1n-3w, 3 miles southwest of Melder, Rapides Parish, opening the fifth Wilcox reservoir in this province. The discovery flowed 290 bbl. of 46°-gravity oil daily from perforations at 9,390-9,405 ft., through a 9/64-in. choke. Flowing tubing pressure was 1,100 psi. with gas-oil ratio 500-1.

Cores from 9,392-9,405 ft. recovered sand with good porosity and permeability and sand from 9,407-09½ ft. which was lignitic and shaly with good stain and odor.

Nearest production is Glenmora field, 13 miles southeast, which produces from lower Wilcox sands. The new discovery is expected to create rapid development in the area.

Hunt Oil Co. et al are building tanks after shutting in 57 Louisiana Delta, C NW SE 20-6n-5e, Catahoula Parish Wilcox discovery. The well flowed an estimated rate of 150 bbl. of oil per day from perforations at 5,160-66 ft. through a ⅜-in. choke. The new strike is located about 2½ miles northeast of Elm Ridge field, La Salle Parish. Log and side wall samples indicated oil sands at 5,151-54 ft., 5,157-60 ft., and 5,162-66 ft.

On the northeast flank of old Carterville-Sarepta field, McCalman-Gunn Drilling Co., Inc., are building tanks at 1 Mrs. P. D. Frazier et al in NE SE 21-23n-11w, Webster Parish. The well flowed oil and gas from open hole at 2,694-2,701 ft. in Buckrange, hole bottomed at 2,701 ft.

Operators are continuing to test at Southwest Gas Producing Co. and W. C. Feazel 1 Redwine, Lincoln Parish prospect. The discovery flowed an estimated 2,500-3,000 M.c.f. of gas daily plus 15 bbl. of condensate per million through a ¼-in. choke. The well is flowing from perforations at 9,708-16 ft. Travis Peak after acidizing with 6,000 gal. The wildcat is located 5½ miles east of Simsboro field production.

Initial state gage has been reported for gas production from the Travis Peak at Continental Oil Co. 1 T. S. Goodwin, 29-23n-12w, Bossier Parish. The well was gaged for an initial production of 1,338 M.c.f. of gas and 37.9 bbl. of condensate daily from perforations 7,356-66 ft. and 7,370-80 ft. in the Travis Peak.

LOUISIANA WILDCAT FAILURES

Concordia Parish: Gulman, Johns & Serio 1

U. B. Evans "A," C SW SE 5-8n-8e, dry, TD 6,038 ft.

Hunt Oil Co. and Gulf Refining Corp. 16 Fisher Lumber Co. "E," C NE NW 32-7n-9e, dry, TD 7,009 ft.

R. A. Campbell and Carter Oil Co. 1 McKittrick, beg. at SWc of Sec. 34 go N 71° 45 ft. E 2,015 ft. then S at right angles 336 ft. to location, 11-5n-9e, dry, TD 7,210 ft.

Richland Parish: Union Prod. Co. 1 C. W. Earle "A," 1,782 ft. south and 1,980 ft. west NEc 30-17n-6e, dry, TD 9,216 ft.

Webster Parish: Hunt Oil Co. 1 Leota Sims, 602 ft. south and 810 ft. east of NWc 5-23n-9w, dry, TD 6,161 ft.

ARKANSAS WILDCAT FAILURE

Union County: C. G. Davis Drilling Co. 1 Beavers, C SW SE SE 11-16s-18w, dry, TD 4,511 ft.

Canadian Fields

Discoveries Set New Record In Western Canada

CALGARY.—More oil and gas discoveries have been made in western Canada during the past week than in any other previous 7-day period in Canada's history. During the week ended July 18 ten exploratory ventures accounted for twelve new strikes, a rate of nearly two per day. Of those seven were oil finds, two were wet gas and three were natural gas discoveries. The new strikes ranged from small to indicated major discoveries, and this week were all in Alberta and Saskatchewan.

Alberta obtained the lion's share of discoveries this week, as eight wells accounted for nine new strikes, including four oil discoveries, two wet gas strikes and three new gas finds. The most recent oil discovery was made by Canadian Gulf Oil Company at its ¾-mile southeast step-out in the Nevis wet gas area. That venture, Gulf 6 Allison, on LSD 6, 29-38-22w4, located about 90 miles northeast of Calgary and about 13 miles west of Stettler, in addition to finding gas and condensate in the D2 Devonian zone, also discovered 38.4°-gravity crude oil in that horizon. Wet gas flow rate, just above the oil column at this 6 Allison well, was in excess of 9,000,000 cu. ft. daily, while oil flow rate during test at bottom 5,646 ft. was 240 bbl. daily.

Wildcatting in Saskatchewan brought three oil discoveries in the past 7-day period. One of the new strikes is a dual zone oil discovery, in the Cantuar area, 19 miles northwest of Swift Current. This well, Socony-Western Prairie 2-14 Cantuar, on LSD 14, 2-16-17w3, found medium gravity oil and heavy oil in two zones. The upper zone, in the Cretaceous, gave up 23°-gravity oil, while the second zone yielded 11.6°-gravity oil. Hole will go down to test the Madison prior to completion.

Saskatchewan's other oil discovery this week came at a wildcat near Buffalo Coulee, about 4½ miles northeast of Coleville heavy oil field. It is a heavy oil discovery in the Banff sands. Drill-stem tests gave up approximately 14°-gravity oil during tests. Production string of casing has been set, and tests are now underway. This well, Canada Southern 24-16 Buffalo Coulee, is on LSD 9, 16-32-24w3.

CANADIAN SUCCESSFUL WILDCATS

Imperial 487 Leduc, LSD 4, 31-39-25w4, TD 5,375 ft., new D3 Devonian oil pool.

Then we dismantled the unit

. . . FOUND IT AS GOOD AS NEW

- Unit 9B16-213, for 15 months of day and night outdoor service, was operated beyond its rated capacity to meet unforseen demands. It was replaced by a larger Standardaire Blower. The engineer of this plant asked that the hard working unit be sealed and returned to our factory so that he personally could observe the dis-assembly and measurements for wear.
- Main and Gate Rotors like new—interior of blower completely dry and free of oil—no wear in other internal parts.
- Timing Gears on Gate and Main Rotors—wear very slight—no increase in back lash could be detected.
- Axial clearance of Main Rotor Shaft Thrust-Radial Bearing, increased less than .0005"—other bearings in perfect order.
- Even at the extremely high peripheral speed of these gears, they were found to be very quiet in service.
- Standardaire Blowers are sturdy—precision built units with proved staying power.

Case History
STANDARDAIRE BLOWER 9B16-213
User—Large Chemical Plant
Service—Continuous Outdoors
Operating Pressure—12 psig
Revolutions—(Approx.) 1,500,000,000
Vol. of Air Handled—(Cu. Ft.)—1,300,000,000

Write for specific data—Dept. F35. Read Standard Corporation, 370 Lexington Ave., New York 17, N. Y.

AXIAL FLOW STANDARDAIRE BLOWER

BLOWER-STOKER DIVISION

READ STANDARD CORPORATION

NEW YORK · CHICAGO · ERIE · YORK · LOS ANGELES

keep it HANDy

your
BRUNTON
POCKET
TRANSIT

has frequent application on the job . . . for rough surveying and little engineering jobs as well as geological work. Always keep a Brunton Pocket Transit handy.

Write for Catalog.

BRUNTON *is a registered trade mark of*

Imperial 2 Gordondale, LSD 11, 25-79-11w5, TD 3,191 ft., IP 4,000,000 cu. ft. gas per day.

CANADIAN WILDCAT FAILURES

Calmont-Calnorth 1 Camrose, LSD 8, 33-46-20w4, TD 3,250 ft.

Tor 4 Bonnyville Gas, LSD 5, 2-63-3w4, TD 1,054 ft.

Britalta-Socony 1 Morrin, LSD 9, 2-32-19w4, TD 7,060 ft.

Great Plains-Sharples 2-10 Rochester, LSD 2, 10-62-24w4, TD 4,400 ft.

Cascade 1 Wayne, LSD 6, 9-54-26w4, TD 5,725 ft.

Ridgeway-Caren 1 Dome, LSD 6, 11-47-7w4, TD 3,003 ft.

EASTERN CANADA

Ontario.—In Elgin County, Western Ashley Minerals is expanding its development program in the gas field in Aldborough Township south of Wardsville. Western Ashley has added 700 acres to its previous 1,022-acre holdings, to provide for a total drilling program of 30 wells, two already completed. The 1 Western Ashley is estimated at 500,000 cu. ft. a day and No. 2 at between 750,000 and 1,000,000 cu. ft. No. 3 is drilling below 1,050 ft. and nearing completion, No. 4 drilling, No. 5 rigging and No. 6 located as the first test on the new acreage. A 6-mile pipe line to link the field with Dominion Natural Gas Co.'s main trunk line is nearly completed.

Eastern Texas

Record Potential Set In Woodlawn Field

DALLAS.—A record potential for Woodlawn gas-distillate field of Harrison County has been set by Stanolind Oil & Gas Co. and Continental Oil Co. 1-A Harden unit. Flowing through ¾-in. choke on tubing, the well was rated at 310,000,000 cu. ft. of gas a day, plus 41.8 bbl. of distillate per 1,000,000 cu. ft. of gas. Pay section is the lower Pettit at 6,412-36 and 6,459-6,500 ft. The well is an inside location and 2 miles northeast of the Woodlawn townsite.

British-American Oil Producing Co. 1 Webb Rogers, wildcat in the Scottsville area, had casing set on bottom at 6,700 ft. and was waiting on production tests.

Humble Oil & Refining Co. has scheduled a deep test just northeast of Woodbine and Rodessa production in Red Lake gas field of Freestone County. The exploration will be 1 H. B. Pyle, Red Lake Gas Unit 2, in the Jose Aguilera Survey. Travis Peak production will be sought to 10,000 ft.

Joe Humphrey 1 Osborne, Hill County wildcat northwest of Covington, was shut down at 7,830 ft. According to field sources, the well will be deepened. Original contract depth was 6,800 ft.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Angelina County: Barron-Griffith Oil Co. 1 W. R. Blake, J. I. Roberts Sur., dry, TD 5,405 ft.

Bowie County: Randy Moore and W. M. Coates 1 Lumpkin, J. W. Womble Sur., 3 miles S Dalby Springs, dry, TD 4,760 ft., elev. 287 ft.

Fannin County: U. S. Epperson Underwriting Co. 1 W. L. Halton, D. Young Sur., 2 miles SE Bonham, dry, TD 4,235 ft.

Grayson County: Superior Oil Co. 1 H. E. Henderson, A. H. Lattimer Sur., 2 miles

PERRAULT
FIBER-CAST
THERMO-SET PLASTIC PIPE
REINFORCED WITH GLASS FIBERS
FOR
THE OIL INDUSTRY
THE GAS INDUSTRY
FRESH WATER SYSTEMS
SALT WATER SYSTEMS
"Everything for the Pipeliner"
★
PERRAULT
Brothers
1130 NO. BOSTON,
TULSA, OKLA. • 5-1103
Export Office:
30 ROCKEFELLER PLAZA
NEW YORK, N. Y.
CIRCLE 6-6260

New ACME
PROTECT-A-VALVE

. . . the "Storm Door" for Gas Masks

Now Acme introduces an auxiliary valve to solve the problems of frozen valves in sub-zero weather, and curled valves due to rubber solvents. Serving much the same as a storm door serves the home, the Protect-A-Valve is designed for use with the Acme No. 6 face piece . . . making it safe for use in temperatures as low as 50 degrees below zero. Write for complete details on this approved Acme development to overcome hazards of rubber-solvent atmospheres and to be ready for next winter's freezing problems.

ACME PROTECTION EQUIPMENT COMPANY
4847 WEST LAKE STREET, CHICAGO 12, ILLINOIS

ECONOMICAL

INFERNO
Oil Burner

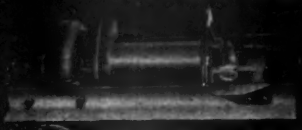
The Inferno Oil Burner shows savings as high as 33% on oil consumption, and boiler repairs are reduced to a minimum. Much less steam is required to operate this burner because the necessary steam used to atomize the oil is supplemented by the blast of primary air through the valve. Write for Bulletin 13-B. Sold direct or through your supply store.

The INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

TULSA* WINCHES

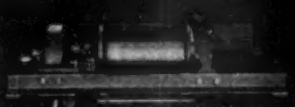
MODEL 10
¾ and 1-ton Trucks
8000 lbs. Capacity

MODELS 3F10 and 3F23
Friction Clutch Winches
7000 and 18,000 lbs. Capacities



MODEL 19
1½ and 2-ton Trucks
15,000 lbs. Capacity

MODELS 12-G and 18-G
For Front mounting on Trucks
6500 and 13,000 lbs. Capacities



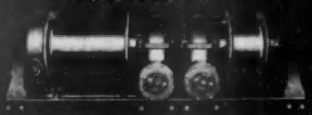
MODELS 12 – 18 – 24
Underslung for ¾ to 3-ton Trucks
8000, 15,000, 30,000 lbs. Capacities

MODEL 12-CH
For Dodge Powerwagons
6500 lbs. Capacity

MODEL 34
2 and 3-ton Trucks
30,000 lbs. Capacity

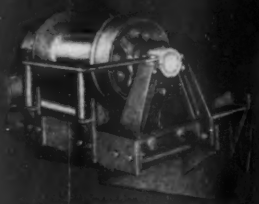
MODELS 21 and 23
1½ and 2-ton Trucks
15,000 and 18,000 lbs. Capacities

MODEL 64
3 and 4-ton Trucks
40,000 lbs. Capacity



MODELS 65 and 70
3 and 4-ton – 4-ton and larger Trucks
40,000 and 60,000 lbs. Capacities

DOUBLE DRUM WINCHES
8000 to 40,000 lbs. Capacities

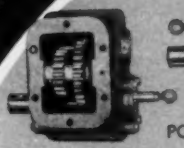


SPEED REDUCERS
15 Models available in a variety of capacities

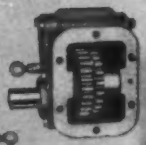
MODEL 80
6-ton Trucks and larger
80,000 lbs. Capacity

TULSA TRACTOR WINCHES
For Crawler Tractors
18,000 to 80,000 lbs. Capacities

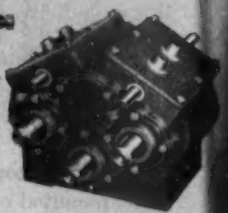
POWER TAKE-OFF
2 forward, 1 reverse speed



POWER TAKE-OFF
1 forward, 1 reverse speed

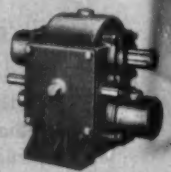


POWER TAKE-OFF
1 speed, heavy duty



DOUBLE END HANGER BEARING
Dual extended shaft mounted on taper roller bearings

POWER DIVIDER
Independent Powering of 2 [illegible] from 1 power source



TWO SPEED HANGER BEARING
2 output speeds for 1 input speed

PUBLIC UTILITY
Extended drum shaft
8000 to 30,000 lbs. Capacities

Tulsa Winch
TULSA, OKLAHOMA
DIVISION OF VICKERS Inc.

Capacity – Refers to Safe Working Ratings

*Reg. U. S. Pat. Off.

LONG LIFE!

Pyrene Vehicle Type Extinguishers give at least twice the service life of ordinary vaporizing liquid extinguishers!

Vibration is the big enemy of fire extinguishers mounted on trucks and buses. Vibration beats on the parts—can knock them out of kilter—make the extinguisher inoperative.

But Pyrene* has licked vibration!

Special construction features, found *only* in Pyrene, are the answer. In every 1 qt. and 1½ qt. Pyrene Vehicle Type Vaporizing Liquid Extinguisher, a special vibration dampener holds the pump mechanism firmly in place, protecting it against both vertical and horizontal vibration. And tough brass linings guard the valve housings in every spot where wear could occur.

In competitive vibrating machine tests, a Pyrene Vehicle Type Extinguisher outlasted three other major brands by more than 2 to 1... the ratio going as high as 15 to 1.

Half life is no bargain. Buy on facts... buy long-lived Pyrene!

*T.M. Reg. U.S. Pat. Off.

Pyrene
MFG. CO. PAT. OFF.
FIRE EXTINGUISHERS

PYRENE MANUFACTURING COMPANY
579 Belmont Avenue • Newark 8, N.J.
Affiliated with C-O-Two Fire Equipment Co.

E Whitesboro, dry, TD 6,556 ft., elev. 730 ft.

Hunt County: Robert M. Bass 1 L. Tankersley, J. McCarty Sur., A-668, 14 miles SE Terrell, dry, TD 4,933 ft.

Texas Gulf Coast

Final Gage Given on Matagorda Discovery

HOUSTON.—Magnolia Petroleum Co. has reported final gage of 62 bbl. of 37.9°-gravity oil per day on 10/64-in. choke at the 3 Ethel Cornelius, oil discovery in the Wadsworth gas area of Matagorda County. This is the first oil discovery reported in the Wadsworth gas area in Matagorda County. Completion was finaled through casing perforations at 9,073-76 ft. in 7-in. casing cemented to 11,994 ft. Operator made hole to 12,010 ft. and set 2½-in. tubing at 9,040 ft. On potential test well flowed under tubing pressure of 300 psi. with 55 per cent and registered gas-oil ratio of 702-1. Location is in the J. C. Peyton Survey, A-74.

Stanolind Oil and Gas Co. has cemented 7-in. casing in 1 D. P. Moore Estate for completion attempt north of East Bay City field in Matagorda County. 7-in. casing was landed on bottom in second sidetracked hole at 9,463 ft. First hole was drilled to 5,218 ft. and whipstocked at 5,162 ft. Second sidetracked hole bottomed at 9,463 ft. was drilled off shipstock at 6,890 ft. run in first sidetracked hole which was drilled to 6,948 ft. Site is on Elisha Hall League.

Chance Drilling Co., Inc. landed 5½-in. casing on bottom at total depth of 9,653 ft. in its 1 Nona Mills after a drill-stem test indicated production of 33°-gravity oil. Drill-stem test ran in open hole at 9,634-53 ft., open 20 minutes through ¼-in. chokes top and bottom, recovered a 1,000-ft. water cushion plus 3,750 ft. of clean 33°-gravity oil. Bottom-hole flowing pressure was 3,600 psi., and shut-in pressure gaged 4,400 psi. Producing sand is in the lower Frio section and was topped at 9,634 ft. Well is a redrill of the old J. C. Chance Well Service, Inc., 1 Nona Mills Co. dry hole drilled 2 years ago.

Anderson-Prichard 1 R. A. Johnson is a Wilcox gas-distillate discovery 1½ miles north-northeast of Frelsburg Wilcox gas production in Colorado County. Operators have not filed absolute open flow potential but on 20/64-in. choke well flowed at the rate of 1,550,000 cu. ft. of gas per day on 20-hour test plus 124 bbl. of 55°-gravity distillate. Completion was finaled through 24 casing perforations at 9,652-54 ft. Hole is bottomed at 11,154 ft. with 5-in. liner cemented to total depth. Location is in the Edward Ruhman Survey, A-479, 1½ miles southwest of New Ulm in Austin County.

Catahoula gas production in the Lakeview field, Wharton County, has been extended 2,600 ft. to the northeast by Commercial Petroleum and Transport Co. in the 1 Wilbeck gas unit. Completion was finaled through perforations at 3,192-98 ft. in the Catahoula gas zone with hole drilled to 3,960 ft. and 5½-in. casing cemented to 3,250 ft. for completion. Well is shut-in subsequent to flowing an ungaged amount of gas on 11/64-in. choke with tubing pressure of 1,100 psi., and 1,050 psi. on 12/64-in. choke.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Colorado County: Anderson-Prichard Oil Corp. 1 R. A. Johnson, Edward Ruhman

Sur., A-479, TD 11,154 ft., prod. zone: Wilcox, perf. 9,652-54 ft. w/24 jets, IPF 1,550,000 cu. ft. gas per day on 20/64-in. choke, plus 124 bbl. distillate, 55°-gravity oil.

Wharton County: Commercial Petroleum & Transport Co. 1 Sam Hamburger, WCRR Sur. 63, A-372, TD 5,901 ft., prod. zone: Frio, perf. 5,760-67 ft., IPF 17,500,000 cu. ft. gas per day open flow.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Bee County: Commercial Petroleum & Transport Co. 1 B. F. Barber, John Kelley Sur., dry, TD 5,617 ft.

Goliad County: A. B. Alkek & Paul Fly 1 A. A. Wellemin, J. Montes Sur., dry, TD 4,525 ft.

Salt Dome Production Co. & C. B. Davis 1 E. O. Jacob, M. de la Pean Sur., dry, TD 5,717 ft.

Jasper County: J. M. Flaitz & R. M. Mitchell 1 J. H. Kurth, Jr. et al Tr., B. W. Johnson Sur., A-842, Sec. 14, dry, TD 7,350 ft.

Jefferson County: George R. Brown et al 1 Sybil Howth et al, T&NO RR Sur. 67, A-214, dry, TD 8,522 ft.

Lee County: Sidney Bacarisse & C. W. Matheny et al 1 J. Mozella Parr, Albert Nantz Sur., dry, TD 3,510 ft.

Matagorda County: Grey Wolf Drilling Co. 1 Helen E. Hurlock et vir., et al., Freeman Pettus Sur., A-73, Lot 2, dry, TD 10,150 ft.

South Louisiana

Initial Potential Given On Calcasieu Discovery

NEW ORLEANS.—The California Co. 1 Domitle Pujol is a new gas-distillate discovery in Calcasieu Parish. A gage of 129.84 bbl. of 44.9°-gravity distillate plus 3,732,000 cu. ft. of gas daily through perforations from 10,466-10,499 ft. was reported. Initial potential flowed on a 10/64-in. choke with casing pressure of 825 psi. and 6,500 psi. of tubing pressure. Gas-oil ratio was 28,641 to 1. Bottomed at 11,250 ft. well has 5-in. casing cemented at 10,800 ft. and 2½-in. tubing swung at 10,449 ft. Location is approximately 5 miles northeast of Lake Charles in Section 18-9s-7w.

Richardson and Bass are continuing to test 1 Shell-Luma-Derbonne possible oil discovery in Allen Parish in effort to squeeze off salt water. Latest drill-stem test, through perforations at 11,976-986 ft., flowed 161 bbl. of oil daily plus 52 per cent salt water on ¼-in. by 3/8-in. chokes. Tubing pressure of 825 psi., gas-oil ratio 3,800 to 1, and 46.3° gravity was recorded. Operator is preparing to reperforate and test the same intervals on the 16,006 ft. well. Test is in Section 19-5s-3w.

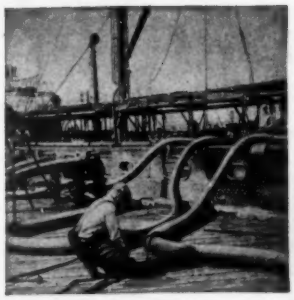
Union Sulphur & Oil Corp. is reported drilling ahead below 9,995 ft. after cementing 7-in casing at 9,858 ft. on the 2 S. S. Hunter, wildcat in Calcasieu Parish. No report was made on electric log run to 9,486 ft. prior to setting casing. The proposed 11,700-ft. test is located 8 miles southwest of Lake Charles in Section 15-10s-10w.

SOUTH LOUISIANA WILDCAT FAILURES

Jefferson Davis Parish: The Texas Co. 1 Elizabeth Prather et al, 36-11s-5w, dry, TD 12,564 ft.

St. John Parish: Union Oil of California 1 St. John Land Co., 25-10s-7e, dry, TD 10,450 ft.

HEWITT-ROBINS



FOR FASTER TANKER TURN-AROUND

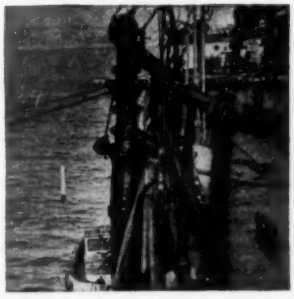
Hewitt-Robins Monarch® Oil Suction and Discharge Hose

Save up to 50% in loading and unloading time. Smooth bore, oil resistant innertube (originated by Hewitt-Robins) cuts friction resistance to a minimum . . . drains clean, as there are no wire "fuel traps" inside.

Prevents nipple leakage—Special Hewitt-Robins Durabond® process assures perfect adhesion of tube to metal . . . tube can't pull loose—it's bonded to tough duck carcass.

Right for heavy service—Strong and flexible, light in weight and easier to handle than rough bore hose.

Call your Hewitt Rubber Distributor (see "Rubber Products", classified phone book) or write for descriptive literature.



STEP UP OFF-SHORE SERVICE

Hewitt-Robins Sea Loading—Barge Loading Hose

For Sea Loading: Monarch® Sea Loading Hose has smooth bore. No coil of wire projects inside the tube . . . turbulence is cut to a minimum . . . flow increased up to 50%.

For Barge Loading: Conservo® Barge Loading Hose recommended for light barge petroleum service . . . comparatively low pressures, no severe handling. Smooth bore for fast flow. Available with either built-in steel nipples or integral rubber flange with swiveling bronze backup ring.

Get complete facts about all types of Hewitt-Robins hose. Call your Hewitt Rubber Distributor (see "Rubber Products", classified phone book) or write for descriptive literature.

HEWITT-ROBINS INCORPORATED
STAMFORD CONNECTICUT

Hewitt Rubber Division
Hewitt Restfoam® Division
Robins Conveyors Division
Robins Engineers Division

no wash-outs

with

If mud gets to your joint threads, it can wash out a string in a hurry. 'Bestolife Lead Seal Tool Joint and Casing Compound gives maximum, *tight* joint make-up, keeps mud out. Standard of the oil country for more than 20 years. Unconditionally guaranteed. Packed in 1¼, 5, 20 and 50 lb. containers. Sold and exported by supply houses throughout the world.

I. H. GRANCELL
1601 E. NADEAU STREET, LOS ANGELES 1, CALIF.

WHERE THERE'S INDUSTRY THERE'S BESTOLIFE

North-Central Texas

Two Conglomerate Fields Linked In Montague

WICHITA FALLS.—Two conglomerate fields in Montague County were linked by American Production Corp. 1 Fenoglio, which completed for a flowing potential of 87.4 bbl. of 40°-gravity oil a day through 10/64-in. choke. Perforations were at 6,376-83, 6,302-07 and 6,442-52 ft. Location in the W. A. Sappington Survey is about midway between Engle and Sztykgold fields.

Cox Drilling Co. 1 Marvin Shaw, wildcat 1½ miles northwest of Stoneburg, recovered 70 ft. of slightly oil and gas-cut mud and 140 ft. of salt water on 2-hour drill-stem test in the conglomerate at 6,180-90 ft. Operators were to drill another 50 ft. and test.

Northwest of Sunset, Russell Maguire 1 Whitehead swabbed mud and oil from the Caddo. Drill-stem test at 5,799-5,810 ft. developed 20 ft. of heavily oil-cut mud, and a second test from 5,811-32 ft. returned 90 ft. of oil-cut mud.

L. T. Burns 43 McGregor, development well in the area 8 miles northeast of Scotland, Clay County, turned in a completion potential of 547 bbl. of oil a day. The flow was through ¾-in. choke from pay between 4,678-4,740 ft.

Hale & West announced location for an Archer County wildcat to be drilled 1 mile east of Scotland, as the 1 Burk Warmuth, 3-24-Clark & Plumb Subdivision. Contract depth was 4,750 ft.

Ed Peterson and J. A. McCarty have staked location for 10-B Wilson, Section 3, H&TC Survey, as a 5,300-ft. Ellenburger test in Reno field of Archer County. Regular pay in the area is a Strawn section around 3,760 ft.

NORTH CENTRAL TEXAS (DISTRICTS 7-B AND 9) SUCCESSFUL WILDCATS

Archer County: J. P. Hornany 1 Calvin, Grooms Sur., A-155, TD 951 ft., Sunsite pay 941 ft., IP pumped 4½ bbl. 37°-gravity oil.

C. A., J. C. and C. S. Perrin 1 Perrin, W. L. Probert Sur., Lot 7, TD 1,454 ft., pay 1,452 ft., IP pumped 42.7 bbl. 38°-gravity oil.

Lewis W. Welch 1-A Abercrombie, Blk. 91, Harris Subd., Club Ranch, TD 5,135 ft., elev. 1,038 ft., Mississippian 5,120 ft., pay 5,125 ft., IP 206 bbl. 41°-gravity oil 13/64-in. choke, TP 400 psi., GOR 942 cu. ft.

Callahan County: Southern Cal Petroleum Co. 1 Andrew Johnson, Sec. 118, GH&H Sur., TD 4,196 ft., elev. 1,924 ft., Ellenburger 4,184 ft., IP 220 bbl. 44°-gravity oil, 12/64-in. choke, TP 540 psi., GOR 909 cu. ft.

Cooke County: T. P. Frost 3 C. L. Links, H. Nail Sur., A-790, TD 1,352 ft., pay 1,342-52 ft. IP pumped 20 bbl. 28°-gravity oil.

T. P. Frost 1-B Ramsey, B. Lusk Sur., A-569, TD 1,386 ft., elev. 852 ft., pay 1,373 ft., IP pumped 16 bbl. 42°-gravity oil.

Jack County: Jack Grace Production Co. 3 Julia Dodson, E. Wray Sur., A-882, TD 3,345 ft., pay 3,338 ft., IP 114 bbl. 44°-gravity oil, 25/64-in. choke, TP 50 psi., GOR 450 cu. ft.

Montague County: Jack Grace Production Co. 1 M. B. Ritchie, Blk. 65, M. Garnett Sur., A-290, Belcher Subd., TD 5,725 ft., elev. 910 ft., conglomerate pay 5,594

ft., IP 226 bbl. 42°-gravity oil, 42/64-in. choke, TP 350 psi., GOR 550 cu. ft.

Joe Reznick 1 Mrs. M. Mitchell, Blk. 59, A. Radcliffe Sur., TD 5,804 ft., conglomerate pay 5,731 ft., IP 121.6 bbl. 41°-gravity oil, ¾-in. choke, TP 40 psi. GOR 600 cu. ft.

Shackelford County: H. M. Gallagher 1 L. H. Hill, Sec. 36, BAL Sur., TD 691 ft., elev. 1,428 ft., pay 678 ft., IP pumped 17.4 bbl. oil.

Stonewall County: Columbian Fuel Corp. 1 J. B. Patterson, 317-D-H&TC, TD 6,822 ft., elev. 1,863 ft., Canyon pay 5,728 ft., IP 21.6 bbl. 39°-gravity oil, GOR 680 cu. ft.

Stephens County: Urice Drilling Co. 1 M. W. Kendrick, Sec. 1,358 TE&L, TD 3,493 ft., elev. 1,300 ft., pay 3,487 ft., IP pumped 32 bbl. 38°-gravity oil.

Taylor County: Lester & Duffield 1 Ford-Shepperd, Sec. 20, BAL Sur., TD 3,935 ft., elev. 1,711 ft. pay 3,922 ft., IP 243 bbl. 39°-gravity oil, 20/64-in. choke, TP 800 psi., GOR 1,800 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Fortex Oil Co. 1-B Turbeville, Blk. 48, Jefferson CSL., dry, TD 1,115 ft.

W. F. Holmes 1-B Petrex Oil Corp., Blk. 111, ATNCL, dry, TD 1,520 ft.

Russell Maguire 1 Prescher, Lot 56, Blk. 3, Clark & Plumb Subd., dry, TD 4,124 ft.

K. R. March 4 Farmer Ranch, Blk. 54, Bell CSL, dry, TD 1,424 ft., elev. 1,217 ft., Gunsite 1,361 ft.

Perkins-Protho 1 J. L. Perkins, Blk. 1,888, TE&L Sur., dry, TD 3,320 ft.

S&S Drilling Co. 1 Stallcup, Lot 30, Clark & Plumb Subd., dry, TD 1,333 ft.

Clay County: Ace Oil Co. 1 First National Bank, Blk. 5, Specht & McCutcheon Subd., dry, TD 2,266 ft.

S. D. Johnson 1 A. F. Castleberry, T. Robbins Sur., A-393, dry, TD 5,337 ft.

Coleman County: Central Texas Gas Co. 1 Veterans Land Board, 95-5-R. Perry Sur., dry, TD 1,267 ft.

G. B. Cree 1 A. R. West, Sec. 3, John H. Gibson Sur., dry, TD 3,490 ft.

B. W. Fitzgerald 1 F. E. Jameson, 7-2-GH&H, dry, TD 3,000 ft.

Maxwell and Freeman 1 J. C. Barnes, T. Flynn Sur., 245, dry, TD 1,570 ft.

Fred Pool 1 Fred Pool, 80-2-N. B. Waters Sur., dry, TD 2,557 ft.

Cooke County: Snuggs & Neal, Inc. 1 Renfro Bros., W. Rousseau Sur., A-1,438, dry, TD 5,524 ft.

Eastland County: Slick-Moorman Oil Co. 1-A Lora Norris, Sec. 15, McLennan CSL., dry, TD 2,500 ft., Bott sand 1,515 ft.

Haskell County: E. M. Evans 1 S. W. Scott, Sec. 143, T. B. Bacon Sur., dry, TD 5,332 ft.

Jack County: Harvey Drilling Co. 1 Harris-Davenport, Blk. 8, Freylan de la Garza Sur., dry, TD 5,824 ft.

Jennings & Haydel 1 W. E. Hunt, J. A. Jackson Sur., dry, TD 600 ft.

Oil Hunters, Inc. 1 P. L. and I. L. Crum, C. A. Newsome Sur., dry, TD 4,925 ft.

Jones County: Bridwell Oil Co. 1 M. O. Johnson, Sec. 27, HT&B Sur., dry, TD 2,150 ft., elev. 1,590 ft, Caddo 1,727 ft.

Bridwell 1 W. G. Swenson, Sec. 1, H&GN, dry, TD 2,151 ft.

Nolan County: General Crude Oil Co. 1 W. W. Davis, 146-1A-H&TC, dry, TD 6,512 ft.

Parker County: C. J. Simpson Drilling Co.

FOR SKILLED PERFORMANCE BY UNSKILLED OPERATORS

INDOORS and OUTDOORS YOUR *BEST* PROTECTION FOR FLAMMABLE LIQUID, GAS AND ELECTRICAL FIRES

ANSUL DRY CHEMICAL FIRE EXTINGUISHING EQUIPMENT

Textile Lint Fires

Flammable Liquid Fires

Gas Fires

Electrical Fires

HAND PORTABLES
•
WHEELED PORTABLES
•
STATIONARY EXTINGUISHERS AND PIPED SYSTEMS
•
TRUCK MOUNTS, TRAILERS AND SELF-PROPELLED UNITS

Ansul Dry Chemical Fire Extinguishing Equipment has world-wide recognition as preferred protection for flammable liquid, gas and electrical hazards. Yet a surprising number of Ansul Extinguishers are used to protect textile mills and paper mills against serious loss from surface fires such as occur in textile lint and combustible paper dust. The textile and paper making industries rely on Ansul Extinguishers for quick control of dangerous flash fires in class "A" (ordinary combustible) materials. Any remaining embers are quenched with small quantities of water, thereby keeping water damage at a minimum.

Surface fires in textile lint and combustible dusts spread rapidly. They need quick control. If you have serious lint or dust hazards, talk with your Ansul representative. He may have suggestions to reduce fire damage and lost production time.

ANSUL MODEL 20-B

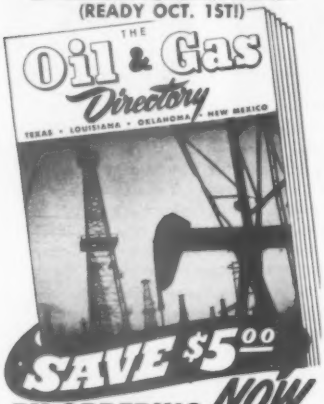
Send for File No. 915. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped systems and Ansul 2000 lb. Stationary Units.

ANSUL CHEMICAL COMPANY
Fire Extinguisher Division
MARINETTE • WISCONSIN

OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES IN THE U. S. A., CANADA AND OTHER COUNTRIES
ALSO MANUFACTURERS OF INDUSTRIAL CHEMICALS, REFRIGERANTS AND REFRIGERATION PRODUCTS

WHETHER IT'S

THEY'RE LISTED IN THE
1952-53
OIL & GAS
DIRECTORY
(READY OCT. 1ST!)



SAVE $5.00
BY ORDERING NOW

Regular Price . . . $22.50 . . . PRE-PUBLICATION PRICE $17.50 . . . POSTPAID and INSURED. ORDER YOURS NOW! Over 65,000 listings, classified and cross indexed for quick reference . . . It's THE WHO'S WHO of the oil and gas businesses in TEXAS, LOUISIANA, OKLAHOMA and NEW MEXICO . . .

PRE-PUBLICATION COUPON
ATTACH CHECK AND MAIL TODAY

THE OIL & GAS DIRECTORY DEPT. 7
504 RICHMOND • HOUSTON 6, TEXAS

Attached is check for $_____
Please ship_____Directories to:
FIRM
NAME_____
ADDRESS_____
CITY_____STATE_____
YOUR
NAME_____TITLE_____

1 O. L. Majors, Angeley Sur., A-4, dry, TD 2,908 ft.

Shackelford County: Hickock & Reynolds 1 J. P. Morris, Sec. 187, ETRR Sur., dry, TD 5,004 ft., elev. 1,713 ft., (base) Caddo 4,934 ft., Lake sand 4,984 ft.

Stephens County: Connally-Jackson 1 B. V. Roberts, 18-7-T&P, dry, TD 3,650 ft.

Urice Drilling Co. 1 Black Bros., 28-4-SPRR, dry, TD 4,555 ft., elev. 1,713 ft., Caddo 3,352 ft., Mississippian 4,405 ft., Ellenburger 4,525 ft.

Taylor County: Miami Operating Co. 1 K. C. Fry, Sec. 64, LAL Sur., dry, TD 4,818 ft.

Wichita County: W. H. Hammon 1 L. W. Walker, Blk. 32, K&N Subd., Cherokee CSL, dry, TD 5,857 ft.

Young County: Archer Drilling & Production Co. 1 Barnett, TE&L Sur. 186, dry, TD 1,206 ft.

Archer Drilling 2 Barnett, TE&L Sur. 186, dry, TD 1,200 ft.

Moco Oil Co. 1 Walter Kunkel, Sec. 402, TE&L, dry, TD 1,153 ft.

Terrell Petroleum Co. 1-M Fay Clarke "B," TE&L Sur. 218, dry, TD 5,074 ft. Caddo 4,193 ft., Mississippian 4,987 ft.

Wright, Clark & Senkel, Inc. 1 J. E. Morrison, TE&L Sur. 1,922, A-996, dry, TD 3,760 ft.

Mississippi

Sixth Wilcox Strike Completed in Adams

JACKSON.—The sixth Wilcox discovery this year in southwest Mississippi was completed this week in Adams County at Gammill-Cashion 1 Winston, Section 45-8n-2w, located northeast of Natches and approximately 1¾ miles southwest of production at Pine Ridge field. On completion test, the well flowed 98 bbl. of 44°-gravity oil in 24 hours through 11/64-in. choke with tubing pressure 270 psi. Completion was from perforations 5,808-09 ft. opposite Wilcox sand. Shows of oil had been present in sidewall cores from 5,808 through 5,815 ft. It is reported that the well is making an estimated 15 to 21 per cent salt water, but no actual gage of the amount of salt water being produced has been made. The Nomenclature Committee of the Mississippi Geological Society has adopted "Vernon field" as the name of this newly discovered producing area. This name is taken from the plantation on which the discovery well is located.

Shows of gas were detected in cuttings and drilling mud and coring at 12,907 ft. in Gulf Refining Co. 25 Andrews, Section 6-1n-16w, Lamar County, deep test at Baxterville field. After core had been cut to 12,920 ft., the well started kicking and mud weight was increased from 10.2 to 10.5 psi. per gallon. Two cores have been cut and recovered 12,907 to 12,948 ft. The section has been interbedded anhydrite and black limestone with oil odor, stain, and fluorescence in fractures in the limestone. No fractures or shows were reported being present in the anhydrite. Total recovery has been 17½ ft. of fractured limestone and 21½ ft. of gray to white anhydrite.

In Madison County, approximately 3 miles southeast of Virlillia field, Continental Oil Co. 1 Lee, Section 4-9n-2e, ran log to 14,132 ft. and has now cored ahead to 14,242 ft. Top of Buckner was picked at 13,708 ft.

Everything
FOR THE
RADIOACTIVITY
LABORATORY

Tracerlab offers the most fully developed line of nuclear instruments, accessories and radiochemicals available today. Regardless of whether your need is for a Geiger tube, a small amount of a radiochemical, or complete instrumentation for an advanced radioactivity laboratory, Tracerlab can fill your requirements. In purchasing all your radioactivity needs from Tracerlab, you not only obtain the convenience of one superior supply source, but you gain the efficiency that comes from having fully matched, integrated laboratory instruments. By starting with an Autoscaler, for example, you can add, as your needs expand, the Automatic Sample Changer and the Tracergraph to obtain a completely automatic radio-assay installation.

- A SCALER FOR EVERY COUNTING NEED
- AMPLIFIERS AND SAMPLE CHANGERS
- OVER 300 RADIOCHEMICALS
- SURVEY METERS, FILM BADGE, PERSONAL PROTECTION DEVICES
- COMPLETE LINE OF G-M TUBES
- CONSULTING SERVICES

Request Catalog C, with 108-pages of text, specifications and illustrations, covering every Tracerlab product.

Tracerlab
130 HIGH ST. BOSTON, MASS

which is 170 ft. lower structurally than in the Virlillia well, Continental 1 Cameron, Section 36-10n-1e.

Lion Oil Co. has plugged and abandoned its deep Rankin Co., Mississippi, Smackover wildcat. Failure was the company's 2 Denkmann, NW NE 22-7n-4e. During the latter series of tests, hole was plugged back and 4 intervals of the Hosston formation tested with recovery from tests being salt water with show of gas. Perforations were at the following points: 11,531-41 ft.; 11,487-97 ft.; 11,192-98 ft., and 11,169-81 ft. Prior to these tests, the company had pulled 390 joints of 5-in. casing after lower zone tested carbon dioxide. After orders were given to abandon hole, operator pulled string of 7-in. pipe which had been run to 15,771 ft.

MISSISSIPPI SUCCESSFUL WILDCAT

Adams County: Dave Gammill-L. Cashion Co. 1 S. L. Winston, 45-8n-2w, TD 6,712 ft., perf. 5,808-09 ft., flowed 50 bbl. of oil per day, 5/64-in. choke, 44° gravity.

MISSISSIPPI WILDCAT FAILURES

Jefferson County: John S. Miller-L. Cashion Co. 1 Ruebin R. Smith et al, 22-8n-2e, dry, TD 6,521 ft.

Madison County: The California Co. 1 Josie Garrett et al, 8-9n-4e, dry, TD 5,515 ft.

Monroe County: W. C. Feazel et al 1 Mrs. L. W. Rea, 12-15s-18w, dry, TD 4,395 ft.

Rankin County: Lion Oil Co. 2 Denkmann, 22-7n-4e, dry, TD 16,276 ft.

Yazoo County: E. P. Thomas et al Yazoo Poor Farm, 34-12n-2w, dry, TD 6,308 ft.

ALABAMA WILDCAT FAILURE

Washington County: Justiss-Mears-S. P. Borden 1 J. W. Odom, 12-3n-3w, dry, TD 7,678 ft.

Appalachian-Ohio

Maryland Reports Two New Gas Wells

PITTSBURGH. — Garrett County, Maryland: Cumberland & Allegheny Gas Co., completed 2 Jasper Riley with an open flow of 1,400,000 cu. ft. of gas, chert 3,293 ft. gas 3,312-22 ft., TD 3,322 ft. Ray Kite 1 Alvin Friend, elevation 2,437 ft., resulted in 330,000 cu. ft. gas, Tully 3,240 ft. chert 3,733 ft. Oriskany sand 3,848 ft., gas 3,918-22 ft., TD 3,922 ft.

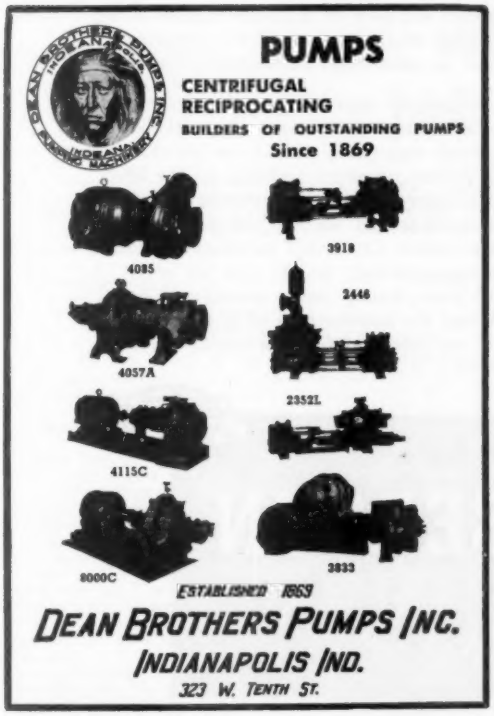
West Virginia.—Big Creek district, McDowell County, West Virginia: Hope Natural Gas Co., 9662 Olga Coal Co., after shot, resulted in 1,309,000 cu. ft. of gas in the Berea sand at a total depth of 5,133 ft. United Fuel Gas Co. 48-6987 Henry Closterman gaged 1,000,000 cu. ft. gas in the shale, total depth 3,390 ft. Portland district, Preston County: Cumberland & Allegheny Gas Co., Cora E. Lewis, 480, elevation 2,180 ft., is drilling at 4,875 ft., recording the top of the chert at this depth. W. H. Harriman, 483 elevation 2,017 ft., chert 4,553 ft., is drilling at 4,585 ft. Clover district, Tucker County: Hope Natural Gas Co., 9691 Lee Spessert, elevation 2,633 ft., chert 6,342 ft., is drilling at 6,641 ft.

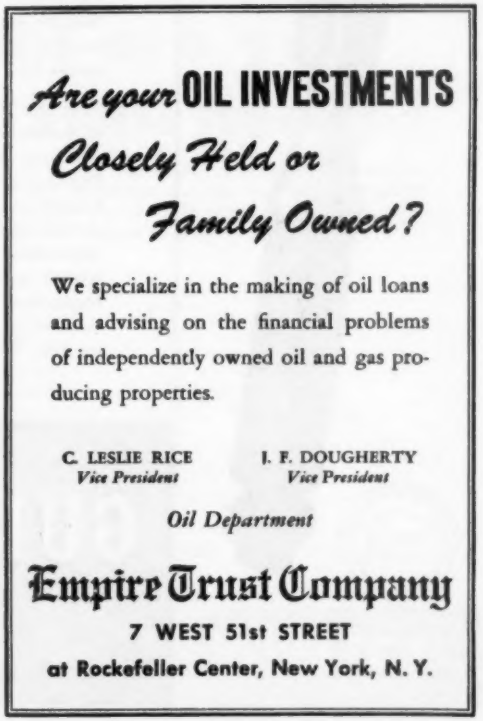
Pennsylvania. — Unity Township, Westmoreland County, Southwest Pennsylvania, Peoples Natural Gas Co., 4003 A. J. Dotterway, cemented back to 7,700 ft., and will drill a new hole. The depth of the hole is 8,294 ft. No. 4008 J. R. Frola, is drilling at 3,445 ft.

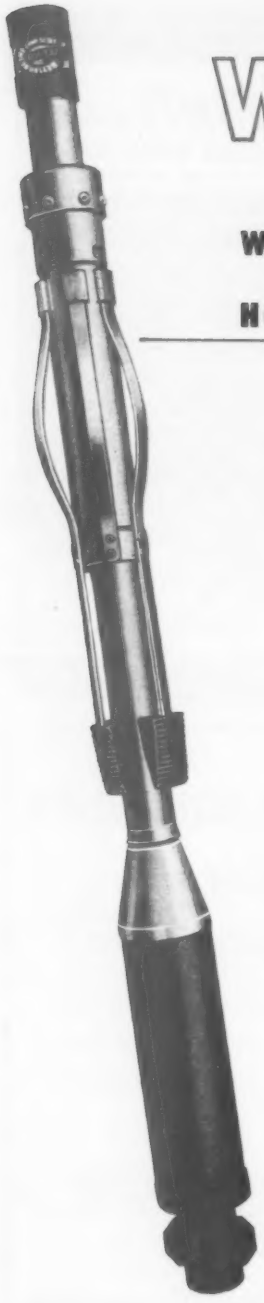
MARYLAND SUCCESSFUL WILDCATS

Garrett County: Cumberland & Allegheny

Over 85% of the torque wrenches used in industry are
STURTEVANT
TORQUE WRENCHES
Read by Sight, Sound or Feel.
• Permanently Accurate
• Practically Indestructible
• Faster—Easier to use
• Automatic Release
• All Capacities
in inch ounces . . . inch pounds . . . foot pounds
(All Sizes from 0-6000 ft. lbs.)
STURTEVANT TORQUE MANUAL
Every manufacturer, design and production man should have this valuable data. Sent upon request.
P.A. STURTEVANT CO.




Are your OIL INVESTMENTS
Closely Held or
Family Owned?
We specialize in the making of oil loans and advising on the financial problems of independently owned oil and gas producing properties.
C. LESLIE RICE
Vice President
J. F. DOUGHERTY
Vice President
Oil Department
Empire Trust Company
7 WEST 51st STREET
at Rockefeller Center, New York, N. Y.



Type "WF" Hold Down Packer with Automatic Latch

WATERFLOOD

WITH GUIBERSON'S *type* 'WF'

HOLD DOWN PACKER WITH AUTOMATIC LATCH

The Type "WF" hold down packer is a low cost tension packer designed especially for water-flooding, salt water disposal and similar projects. It may also be used for injecting fluids under moderate pressures into the formation below the packer and for other operations requiring tubing pressure in excess of pressure in the annulus.

The packing element on the "WF" is a long sleeve type with sixteen inches of exposed soft rubber that will effectively seal even a rough and pitted casing wall. It will not vulcanize to the casing. Design and construction is such that the same packer will pack-off in a wide range of casing weights; an advantage which, coupled with low initial cost, makes this packer an exceedingly economical investment.

The "WF" has the easy-run, easy-set, easy-pull characteristics of all Guiberson packers. Ample fluid by-pass eliminates down swabbing and assures easy run-in without the use of a valve. Friction springs provide necessary back-ups for the latch mechanism which features an all-metal latching dog with corrosion-resistant coil springs. An anti-lock device assures dependable latch release. Downward movement of tubing in relatch operation automatically latches slips out of engagement with head, freeing packer immediately for removal or resetting. For positive pack-off at lowest cost, use the "WF" in any recommended application.

GUIBERSON

Gas Co. 2 Jasper Riley, 1,400,000 cu. ft. gas, chert 3,293 ft., gas 3,312-22 ft., TD 3,322 ft.

Ray Kite 1 Alvin Friend, elevation 2,437 ft., 330,000 cu. ft. gas, Tully 3,240 ft., chert 3,733 ft., Oriskany sand, 3,848 ft., gas 3,918-22 ft., TD 3,922 ft.

OHIO

The area in and around Jackson Township, Knox County, continues as the most active in the state. Two semi-wildcats have been started in Clay Township, adjoining to the west: the Mid-Atlantic 1 C. & H. McKee, Lot 16, is rigging-up, and the I. C. Robinson et al 1 Allen Taylor, Section 20, is drilling. In Mt. Zion pool, the Mid East 2 Homer Thompson, Section 18, Jackson Township, made 10 bbl. natural and 125 bbl. in 24 hours after shot from Clinton sand found at 2,956 ft.

Several wildcats are running now: Frank O'Mara is drilling on 1 Buckingham and Wright, Section 25, Trimble Township, Athens County. Ed Obermiller is making another attempt to find gas in Copley Township, Summit County, this test on 1 L. M. Brammer, Lot 48.

B. H. Putman et al found the Clinton at 5,509-87 ft. in the wildcat on 1 C. D. Curtis heirs, Section 29, Belpre Township, Washington County. No showings were found and the test will be continued to the Medina.

OHIO WILDCAT FAILURES

Portage County, Shalersville Township: Frank Lyons et al 1 Standard Slag Co., Lot 73, Clinton 4,218-25 ft., TD 4,315 ft.

Washington County, Watertown Township: B. H. Putman et al 1 R. D. Reed, Lot 4, Clinton 5,654-78 ft., TD 5,800 ft.

California

Wheeler Ridge Area Activity Increasing

LOS ANGELES.—Activity in the vicinity of Richfield Oil Corp.'s recent 9,500-ft. Eocene discovery at Wheeler Ridge in southeast San Joaquin Valley continues to grow. Latest wildcat announced was one slightly over 1 mile eastward. When started in the near future this will bring the number of tests, searching either for the Eocene or Miocene, to a total of six.

Using the heavy rig employed at its recently abandoned wildcat in the Pine Mountain area of Ventura County, Standard Oil Co. of California will drill 337 Kern County Land-2 in 27-11n-20w. In the same section Standard already has a Miocene test, 39 K.C.L., under way in NW SE 28, almost ¾ mile east of the Eocene discovery, its 356 K.C.L. was below 3,800 ft. on its way to the Eocene.

Southeast of the discovery about 2 miles, Signal Oil & Gas Co. 1 Signal-Intex-K.C.L. was below 3,100 ft. This test is slated to be carried to the Miocene. Richfield's southeast and southwest offsets to the discovery were drilling at 1,900 and 8,000 ft. respectively. The latter, 76-29 K.C.L., has indicated it will make a large producer in a new Miocene sand at 6,400 ft.

Another wildcat getting started in this general area was Continental Oil Co. S-1 Conoco-K.C.L. Located in 1-10n-20w, the test is about 4 miles southeast of Wheeler Ridge and 1½ miles west of Tejon Ranch production.

A drilling upsurge is slated for the shallow Tejon Hills area following the purchase of Tejon Hills Oil Co.'s properties there by Sunset Oil Co. The new operator plans to drill 25 wells at the rate of four or five a month. The company also plans to drill several wildcats on the 1,600-acre lease, which now has 22 wells producing from the Santa Margarita sand found at 400-500 ft.

About 9 miles southwest of McKittrick on the western side of San Joaquin, in 7-31s-21e, Terry Drilling Co. was erecting derrick for 1 U.S.L.-Kane. Located in San Luis Obispo and about 2 miles northwest of a dry test which last fall found the Eocene at 3,700 ft., considerable interest is being evidenced in the wildcat. Several companies have made dry-hole contributions.

Richfield was preparing to abandon 1 Snedden-Teilman, a wildcat about ¾ mile northwest of Salt Creek production. Drilled to 2,129 ft. and plugged back to 970 ft., tests in the tar sands of the Tulare formation at 640 to 959 ft. showed them to be wet.

Standard of California has recompleted the Ciervo anticline, San Benito County, wildcat which Idria Oil Co. last October finaled as a 120 bbl. well, flowing through the drill pipe, at 1,100 ft. The test, 3 Nicholas in 28-16s-12e, was drilled deeper to 1,183 ft. where it was completed as a 20-bbl. producer.

A new wildcat announced for upper San Joaquin Valley was B. B. Breckenridge 1 Jeremias. The test will be drilled in NE NE 31-16s-20e, or about 1 mile north of the northeast end of Camden field.

About 2 miles east of San Ardo field in Monterey County, Standard Oil Co. has staked 6-3 Alexander-D in 3-23s-11e. Another Coastal wildcat announced was in the Creston area of San Luis Obispo County. There in 4-28s-13e Amerada Petroleum Corp. will drill 5 Creston Community.

CALIFORNIA SUCCESSFUL WILDCAT

Kern County, San Emidio Front, new Pliocene sand discovery: Richfield Oil Corp.

CALL NELSON
FOR FAST
ELECTRICAL SUPPLY SERVICE
CALL 5-1241 TULSA

When it's Electrical
NELSON
ELECTRIC SUPPLY CO.
526 NORTH MAIN • TULSA

what are your HOUSING needs?

If it's housing of any description, for domestic or export use, Houston Ready-Cut House Co. can furnish it complete, as you want it, where you want it, when you want it, with extra savings for you in time and cost.

Check off your needs:

☐ Employee housing — 1 or 100
☐ Office buildings, warehouses or custom structures
☐ Planning Service for 1 house or a development
☐ Erection service for turnkey jobs

NOW *Phone, wire or write for detailed information on project housing for "package" leasing without capital outlay! There's no obligation.*

PREFABRICATED HOME MANUFACTURERS' INSTITUTE phmi

HOUSTON Ready-Cut HOUSE CO., Inc.
Prefabricated Housing for Industry Since 1917
P. O. BOX 126 HOUSTON 1, TEXAS

18-21 San Emidio, SW SW 21-11n-22w, flowed 454 bbl. per day through perforations at 7,247-80 ft., 17.7° gravity, 2 per cent cut, 48/64-in. bean, TD 8,006 ft., plugged back at 7,280 ft., elev. 913 ft.

CALIFORNIA UNSUCCESSFUL WILDCATS

Kern County, Ant Hill area: Mauer & Fisher 10 Linda, 12-29s-29e, dry, TD 1,264 ft.

Mt. Poso area: Bluebell Oil Co. 1 Murdoch, 34-27s-28e, dry, TD 2,145 ft.

Salt Creek area: H. B. Graves 1 Glory Hole, 24-29s-20e, dry, TD 1,625 ft.

Tunis Creek area: Reserve Oil & Gas Co. 88-30 "Well," 30-11n-18w, dry, TD 4,176 ft., drilled deeper from 2,404 ft.

Kings County, Pyramid Hills are: Norris Oil Co. 116-28 "Well," 28-24s-18e, dry, TD 1,022 ft.

Los Angeles County, Castaic Hills area: Continental Oil Co. et al 22-36-A Rynne-Fisher, 36-5n-17w, dry, TD 6,063 ft.

San Joaquin County, Vernalis area: Union Oil Co. 36-8 Schnabel, 8-4s-6e, dry, TD 5,288 ft.

San Luis Obispo County, Temblor Range area: Neaves Pet. Dev. 2 Neaves-Elkhorn, 28-32s-22e, dry, TD 2,480 ft.

San Mateo County, La Honda area: Jergins Oil Co. 2 YMCA, 26-7s-4w, dry, TD 4,735 ft.

Oklahoma

Jackson Oil Discovery Runs Casing For Tests

MID-CONTINENT PETROLEUM CORP. has run casing and is preparing to test its 1 Sue Richardson, indicated oil discovery well in the SE SW SE 30-1n-19w, 10 miles southeast of Altus, in Jackson County, southwestern Oklahoma. In the meantime, it has made location for a south offset, 1 Sallie Moon, NE NW NE 31-1n-19w, to which rotary rig is being moved. Location of the area is a mile northwest of the Tipton pool but separated from that pool by dry holes.

The well has prospects of production in three horizons, including the Canyon, dolomite, the basal Canyon sand, and a granite wash section. Best showings were in the basal Canyon sand, in which a drill-stem test at 2,156-61 ft., flowed gas and oil and recovered 1,300 ft. of clean oil. A test of the dolomite at 1,971-91 ft., also flowed gas and oil, along with some water, and yielded 960 ft. of oil and 1,120 ft. of water in the breakdown. The granite wash carried saturation in a succession of zones extending from 2,268 ft. to 2,490 ft., drill-stem tests of which yielded varying amounts of oil and oil and gas-cut mud.

Since these previously reported tests, the hole has been deepened to the Arbuckle, the well's original objective, which proved dry. Total depth is 2,702 ft. with top of the Arbuckle at 2,548 ft. Casing run through the above indicated pay zones, is bottomed at 2,580 ft. in the Arbuckle.

Mohawk Drilling Co. 1 Ralph Johnson, indicated oil discovery well in the NW NW SW 6-18n-2e, 4 miles southwest of Stillwater, in Payne County, flowed at the rate of 23 bbl. of oil per hour while testing its prospective Viola lime pay zone, opposite which casing was perforated at 4,912-42 ft. Flow followed a 1,000-gal. acid treatment. This is the first Viola production in that part of the state. Since the above test, operators have set packer above the Viola and perforated casing at 4,356-82 ft., opposite a prospective Skinner sand pay, which is being tested. Location is a mile west of the Northeast Ramsey field (Skinner sand production) and 1½ miles southwest of the North Ramsey field (Misener production).

Wilcox Oil Co. 1 Tims, a wildcat located in the SW SE SE 28-13n-7e, 8 miles north of Paden, Okfuskee County, flowed gas in 8 minutes and filled 475 ft. of clean oil and 35 ft. of oil-cut mud in a 60-minute drill-stem test at 3,640-51 ft. in Dutcher sand. Since then, hole has been deepened to 4,395 ft. and casing run for production tests.

A. G. Oliphant has opened a new Mississippi chat at his 1 Osage, in the N½ SW SW 13-24n-4e. The well, located 3 miles west of the Doga pool, nearest production, is estimated good for 25 bbl. of oil per day natural. Total depth is 3,339 ft. with top of the chat at 3,337 ft. Hole is open from 3,340 ft.

George Pease, Jr., 1 Osage, NE NE NW 6-24n-7e, a wildcat northwest of the Naval Reserve pool, Osage County, pumped 33 bbl. of oil in 24 hours from Burbank sand at 2,623-83 ft.

OKLAHOMA SUCCESSFUL WILDCATS

Kay County: Orville E. Parker 1 Rollins, SE NE SE 22-29n-1e, pumped 15 bbl. of oil from Peru 3,087-3,121 ft., TD 3,552 ft. PBTD 3,125 ft.

Osage County: T. F. Dukes 1 Osage, NE NE NE 8-22n-8e, flowed 120 bbl. of oil from Hominy 2,864-2,901 ft., TD 2,901 ft.

OKLAHOMA WILDCAT FAILURES

Comanche County: Chas. W. Scott and B. W. Fitzgerald 1 Zeigler, SW NW NW NE 2-2n-10w, dry, TD 3,007 ft.

Garvin County: Carter Oil Co. et al 1 Selby-Dean, NW SW 32-2n-3w, dry, TD 11,795 ft.

Orville H. Parker 1 Thompson, SW NW NE 33-4n-1w, dry, TD 4,730 ft.

Greer County: J. S. Bridwell 1 Arnold, NE NW SE 5-3n-22w, dry, TD 4,548 ft.

Jefferson County: Seaboard Oil Co. 1 Fischer et al, NW NW NE 9-5s-8w, dry, TD 2,831 ft.

Lincoln County: Clark & Cowden 1 Brown, NW NE NW 4-16n-2e, dry, TD 5,100 ft.

D&L Oil Co. 1 Sewell, NE SE NW 24-16n-2e, dry, TD 5,045 ft.

Oklahoma County: Rogers-Fain Drilling Co. 1 Murchison, SW NE NW 8-12n-3w, dry, TD 6,933 ft.

Payne County: Harold D. Reeves 1 Creager, NE NE NE 3-17n-4e, dry, TD 4,253 ft.

Stephens County: Fleet Drilling Co. 1 Presley, NW SW SW 32-1n-4w, dry, TD 6,319 ft.

LEGAL

Sealed bids for oil and gas mining leases on 13,850.91 acres of trust lands on the Crow Indian Reservation, Big Horn County, State of Montana, will be received at the Office of the Superintendent, Crow Indian Agency, Montana, up to 2:00 o'clock P. M., Montana Standard Time, August 1, 1952. For further information, call or write L. C. Lippert, Superintendent, Crow Indian Agency, Crow Agency, Montana.

LEGAL

4,573.08 ACRES of Tribal and 6,961.52 ACRES of Allotted Indian lands located in Townships 1 North, 1 and 2 South, Ranges 1 East, 1 and 2 West, USBM, on the Uintah and Ouray Reservation, Utah, are being advertised for oil and gas lease, bids on which will be opened July 30, 1952, at 2:00 P.M., at the office of Harry W. Gilmore, Superintendent, Uintah and Ouray Agency, Fort Duchesne, Utah. Full particulars may be obtained from the office of the Regional Oil and Gas Supervisor, U. S. Geological Survey, Casper, Wyoming, or from the Uintah and Ouray Agency.

Kansas

Stafford County Gets Two-Pay Oil Discovery

PETROLEUM, INC., has found promising oil showings in Arbuckle lime at its 1 Stroble, northwestern Stafford County wildcat, which previously had given indications of production in the shallower Lansing-Kansas City lime section. As a two-zone oil discovery well, it now has casing run through both indicated pay zones for completion. Location is in the C N½ NW SW 9-22s-14w, 2½ miles southwest of the Smallwood pool and 3 miles northwest of the Oscar West pool.

Arbuckle top was checked at 3,861 ft. A 60-minute drill-stem test with bottom at 3,879 ft. got 950 ft. of oil and 90 ft. of heavily oil-cut mud with 1,075 psi. pressure. Present total depth is 3,911 ft. with casing at 3,910 ft.

About 9 miles to the southeast in the SE NE SW 26-22-13, same county, Shelley-Miller Drilling Co. has another wildcat showing for production in the Lansing-Kansas City lime at its 1 Spangenberg. It also drilled to the Arbuckle but failed to get commercial indications in that pay and will complete in the upper zone. Lansing was topped at 3,265 ft. Three drill-stem tests, the first at 3,335-65 ft., the second at 3,399-3,404 ft., and the third at 3,431-51 ft., recovered various amounts of oil and/or oil and gas-cut mud. Arbuckle was logged at 3,641-44 ft. and casing run to 3,642 ft. in this zone. This discovery is 1½ miles from nearest production, the Heyan pool to the north.

KANSAS SUCCESSFUL WILDCAT

Stafford County: Cities Service Oil Co. 1 Westgate, NE SE NE 6-25s-15w, flowed 4,100 M.c.f. of gas from basal Pennsylvanian sand 4,166-4,207 ft., TD 4,570 ft.

KANSAS WILDCAT FAILURES

Barton County: W. D. Pardoe 1 Hittle, NW NW SE 19-20s-13w, dry, TD 3,600 ft.

Butler County: B. Gralopp 1 Simmons, NW NE SE 3-29s-3e, dry, TD 3,044 ft.

Gove County: C. E. Skiles et al 1-A Hefner, NE NE NE 13-14s-28w, dry, TD 4,469 ft.

Graham County: Keating Drilling Co. 1 W. K.I.T. School, SE SE SE 33-7s-21w, dry, TD 3,655 ft.

Murfin 1 Ferrell, NE NE NW 32-9s-22w, dry, TD 4,035 ft.

McPherson County: Welch & Olsson 1 Stucky, SW SW SW 12-18s-2w, dry, TD 2,920 ft.

Ness County: Vickers 1 Squires, SE SE SE 7-16s-22w, dry, TD 4,597 ft.

Norton County: Anschutz Drilling Co. 1 Zeirlin, NW NW SE 36-4s-25w, dry, TD 3,918 ft.

Osborne County: Duke & Wood 1 Harrell, SE NW NE 28-10s-14w, dry, TD 3,652 ft.

Rice County: Greeley Drilling Co. 1 Bronleeve, SW SW NE 13-18s-7w, dry, TD 3,490 ft.

Anschutz Drilling Co. 1 Fair, SW SE SE 29-20s-9w, dry, TD 3,325 ft.

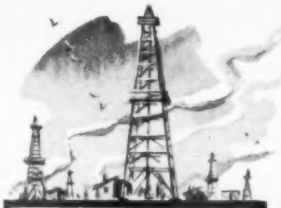
Scott County: Studnicka 1 Newby, NW NW SE 13-18s-32w, dry, TD 4,042 ft.

Sheridan County: Prime Drilling Co. 1 Fallon, SE SE NE 19-10s-27w, dry, TD 4,630 ft.

Stafford County: Jackson Drilling Co. 1 Munz, SE SE SE 2-24s-15w, dry, TD 4,155 ft.

Derby-Pickrell 1 Benton, SE SE NE 3-25s-13w, dry, TD 4,306 ft.

Alpine 1 Wilson, SW SW NW 19-25s-14w, dry, TD 4,504 ft.



SOUTH TEXAS NATIONAL BANK OF HOUSTON

Oil PRODUCTION Loans

Complete financial services for all phases of the oil industry.

SOUTH TEXAS NATIONAL BANK

213 MAIN STREET • HOUSTON, TEXAS
MEMBER FEDERAL DEPOSIT INSURANCE CORP.

Trego County: L. Phillips 1 Rimker, NW NW NW 9-12s-22w, dry, TD 4,143 ft.

MISSOURI SUCCESSFUL WILDCAT

Clinton County: Fell et al 1 Chase, NW SE 4-55n-30w, 100 M.c.f. of gas daily from Squirrel sand 487-510 ft., TD 510 ft.

MISSOURI WILDCAT FAILURES

Clinton County: Fell et al 1 Elliott, SE NE SE 16-56n-30w, dry, TD 475 ft.

Fell et al 1 Bacon, C SW SW 4-56n-30w, dry, TD 525 ft.

Central Area

ILLINOIS

E. A. Obering is putting his 1 Lowell Anderson, oil-discovery well in southwestern Clay County, on the pump following swabbing tests which produced at the rate of 1½ bbl. of oil per hour. Pay zone is McClosky lime at 2,763-67 ft. Tests followed a 1,000-gal. acid treatment. Location is in the NW SE SE 8-3n-5e, 6 miles northwest of Xenia and 2 miles from nearest other production.

INDIANA

A ¾-mile extension of production in the area 1½ miles north of Monroe City, in Knox County, is in prospect where R. L. Tilton 1 Adams-Alton got 460 ft. of gas, 130 ft. of clean oil, and 280 ft. of oil-cut mud in a 2-hour drill-stem test at 1,561-65 ft. in Rosiclare lime, main producing horizon in that area. Bottom of the hole at 1,565 ft. still is in oil saturation. Casing has been run to the top of the pay for completion.

V. R. Gallagher's previously indicated Salem lime discovery well on Ribeyre Island, in the Wabash River bottoms, at the south end of the New Harmony field, in Posey County, swabbed ¼ bbl. of oil per hour in tests of the pay, logged at 3,922-54 ft. Pay is in open hole at 3,905-66 ft. Location is in the SW NE NE 17-5s-14w, 3 miles southwest of New Harmony.

Cherry & Kidd and associates have completed their 1 Callard, NE SW SE 12-3s-13w, to open a new Pennsylvanian sand producing area in Gibson County. The discovery has been designated as the Johnson South pool. The well pumped 14 bbl. of oil per day with pay at 1,081-84 ft. and 1,093-94 ft.

WESTERN KENTUCKY

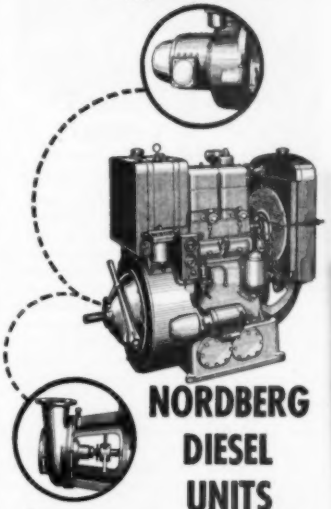
G. W. Miller Drilling Co. 1 Overfield, a wildcat located in the NW NW NW 10-O-24, southern Henderson County, got a good blow of gas and recovered 1,840 ft. of oil and 30 ft. of oil-cut mud in a 60-minute drill-stem test at 2,555-61 ft. in O'Hara lime, logged at 2,454-60 ft. Casing has been run through the pay for completion. Total depth is 2,617 ft. Location is 1½ miles north of Robards and a mile northeast of the new Greenbrier North pool, where two good wells have been completed in Benoist sand.

Production of the Hitesville area is being extended more than a mile to the northeast at a point 2 miles south of Smith Mills, in western Henderson County, where Mansfield Drilling Co. 1 Latta, 19-P-21, is estimated good for 150 bbl. of oil per day from McClosky lime at 2,568-75 ft. and 2,580-88 ft. Pay is in open hole at 2,564-90 ft.

EASTERN KENTUCKY

In Greenup County, 19-X-79, Van Everman et al topped Corniferous lime at 1,318 ft. at 1 O. Hall stepout test to Oldtown pool.

Versatile—Low Cost Power for Hundreds of Applications



NORDBERG DIESEL UNITS

IN HUNDREDS of applications in many industries . . . for power units on shovels, for crane magnets, for pumps in mines, quarries, and irrigation, for petroleum production pumping, for auxiliary generating sets, ashore and afloat, for standby lighting units in manufacturing plants . . . that's where you'll find NORDBERG "4FS" Diesel Engines on the job, producing dependable power at low operating and maintenance costs.

Built in 1, 2, and 3-cylinder sizes from 10 to 45 hp, these heavy duty medium speed units are available as straight power units with stub shaft or clutch power take off—as packaged generntor sets producing from 6 to 30 K.W.—and as "packaged" centrifugal pumping units.

Send the coupon today for more details.

NORDBERG
BUILDERS OF AMERICA'S LARGEST LINE OF HEAVY DUTY DIESELS

Mail this coupon Today

Nordberg Mfg. Co.
Milwaukee, Wis. 4-352-1CQFMOP

Please send literature describing the full line of Nordberg "4FS" Diesel Power Units.

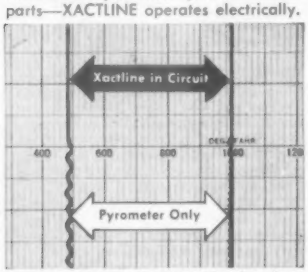
Your Name_____
Company_____
Address_____
City_____ Zone____ State_____

Automatic
"STRAIGHT-LINE" TEMPERATURE CONTROL with XACTLINE

ELIMINATE
Overshooting
Undershooting

Are you going to continue to put up with that troublesome overshooting and undershooting inherent in your conventional pyrometer control—especially when it is so easy to eliminate that saw-tooth effect?

Put XACTLINE in the control circuit. XACTLINE anticipates the temperature changes—before they occur. And too, it nullifies the varying amounts of thermal lag, residual heat, and mechanical lag—producing a short on-off cycle resulting in "Straight-Line" temperature control. This performance is possible because there is no dependence upon mechanical parts—XACTLINE operates electrically.



Exact reproduction of temperature chart for a heating process showing the comparison of the "Straight-Line" temperature control produced by XACTLINE and the saw-tooth curve obtained with only conventional control.

XACTLINE is applicable to any indicating or recording pyrometer control of the millivoltmeter or potentiometer type. It should be used wherever close temperature control is required—any type of electrically heated oven, furnace, kiln, injection molding machine, and fuel-fired furnaces equipped with motor-operated or solenoid valves.

XACTLINE is a complete unit. No adjustment or coordination with the control instrument is required regardless of the size of the furnace, length of the heating cycle, or size of the load. Installation is very simple—can be either flush or surface mounted.

PRICE **$89.50** F.O.B. CHICAGO
Nothing else to Buy

GORDON SERVICE

CLAUD S. GORDON CO.
Manufacturers & Distributors
Thermocouple Supplies • Industrial Furnaces & Ovens
Pyrometers & Controls • Metallurgical Testing Machines
Dept. 27 • 3000 South Wallace St., Chicago 16, Ill.
Dept. 29 • 2035 Hamilton Ave., Cleveland 14, Ohio

Drilled in 6 ft. to 1,324 ft. total depth well showed for 3 bbl. oil natural.

In Powell County and in Pilot pool, J. S. Miller, Trustee, have completed 7 J. S. Abbott heirs on Whites Branch for 20 bbl. oil daily from Corniferous lime topped at 913 ft. and bottomed at 930 ft.

In Big Sandy gas field and in the Knott County sector, United Fuel Gas Co. have completed 6860 J. R. & Malissa Collins for 600,000 cu. ft. of gas daily from the Big lime at 2,352 ft. and the Devonian black shale at 2,900 ft. to 3,412 ft., total depth.

MICHIGAN

Production totaled 112 bbl. natural first 7 days at McClure Oil Co. 1 McClain, NW SE SE 14-16n-17w, Weare Township wildcat Traverse oil strike, Oceana County. At attempted acid treatment took out 7-in. casing packer and seat, and long string of pipe, set at 1,667 ft., was cemented in preparation for acidizing. Well will be acidized with about 300 gal. Traverse lime was logged at 1,672 ft. and hole carried 1,250 ft. of free oil natural in 35 hours at 1,675 ft., total depth. After tubing disc was broken well flowed 20 bbl. of oil and then went dead. Other production tests showed the following pump gages: 42 bbl. one day, 10 bbl., 6 bbl., 5 bbl., and 9 bbl. on last day of testing before casing was cemented. At the end of the 7-day period no water was showing.

The Lands Division, Michigan Department of Conservation, announced that the next public auction of oil and gas lease-rights to state-owned lands would be held in Lansing, August 7-8, beginning at 10:00 a.m., EST., in the Senate Chamber, State Capitol Building. Approximately 104,000 acres of wildcat leases will be offered in 26 Michigan Counties. There will be 160 acres of so-called proven leases, subject to a sliding-scale overriding royalty, placed on the block in the Rise City Richfield oil pool, Ogemaw County. Acreage included in the sale which may be in the play for Salina-Niagaran wildcatting on the rims of the basin are expected to draw considerable interest from buyers at the sale.

ILLINOIS SUCCESSFUL WILDCAT

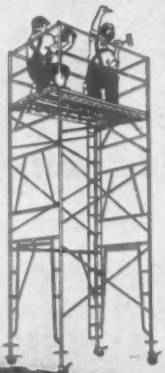
White County: George & Wrather 1 Roser, SE NE NE 1-5s-8e, IP 58 bbl., Aux Vases sand 3,172-78 ft., TD 3,375 ft. (extends Trumbull pool).

ILLINOIS WILDCAT FAILURES

Clark County: F. Henigman 1 Knecht, SE SW SW NW 32-11n-14w, dry, TD 437 ft.
Edwards County: Calvert Drilling, Inc., 1 Lee, SW NE NE 11-1s-10e, dry, TD 3,382 ft.
Effingham County: T. S. Doran 1 Abraham, NW NW SW 7-6n-5e, dry, TD 2,457 ft.
George & Wrather 1 Gibson, NW NW NE 21-6n-5e, dry, TD 2,577 ft.
Jackson County: W. R. Braun 1 Wright, NW SW NE 12-7s-4w, dry, TD 832 ft.
Marion County: Fox & Fox 1 Mercer, NE NE NE 22-1n-2e, dry, TD 2,162 ft.
Montgomery County: Don Slape 1 Pruitt, NW NW SW 4-9n-3w, dry, TD 2,089 ft.
Perry County: George Zicos 1 Eater, SE SW SW 11-4s-1w, dry, TD 1,254 ft.
Kingwood Oil Co. 1 Mahn, C SW NW 7-5s-2w, dry, TD 2,965 ft.
Randolph County: W. R. Braun 1 Gretzmacher, SE NE NE 13-7s-6w, dry, TD 785 ft.
St. Clair County: R. M. Dooley 1 Mugele, NW NE SE 1-1n-6w, dry, TD 2,847 ft.
Washington County: T. G. Glass 1 Hasheider, SE SE NW 7-1s-4w, dry, TD 2,350 ft.
T. G. Glass 1 Kucharski, NW SE NW 18-3s-1w, dry, TD 1,353 ft.

(Continued on page 434)

Safety is no Accident!



It's engineered into
SAFWAY
maintenance towers

Only Master Welders work on SAFWAY Equipment
Interchangeable parts constructed by safe, strong, lifetime welding of high carbon tubing.

All SAFWAY Equipment Treated with Rust Inhibitor
Maintains accurate fit of parts and fasteners to assure safe, rigid maintenance towers.

Enamel is Baked on All Surfaces, Inside and Out
Improves appearance of equipment—helps insure lasting fit of parts and long life.

All SAFWAY Equipment is Engineered to Last
With only routine care, Safway equipment will deliver a lifetime of safe, efficient service.

Write for this Free Bulletin

RENTED and SOLD
by distributors everywhere

SAFWAY
STEEL PRODUCTS, Inc.
6242 West State St.
MILWAUKEE 13, WISCONSIN
Tubular Steel Scaffolding and Equipment

Rocky Mountain

Shows Reported in Unita Wildcats

DENVER.—The California Co. had shows in two wildcats in Utah's Uinta basin this week, adding further promise to additional Green River shale production from the Tertiary portion of the basin.

The 1 Unit, C NE NE 24-6s-4w (UWM) in the Antelope Creek area of Duchesne County recovered 180 ft. of oil on 2-hour drill-stem test of the zone 4,920-62 ft. Flowing pressure was 25 psi., shut-in pressure 850 psi. Two lower tests recovered mud. The operator is coring below 5,150 ft. At the company's 3 Unit, W½ NW NE 10-6s-20e (SIM) between Roosevelt and Red Wash fields an 80-minute test from 7,736-58 ft. recovered 544 ft. of 29.2°-gravity oil, with flowing pressure 45-188 psi., shut-in pressure 1,320 psi. Test from 7,746-7,815 ft. recovered 250 ft. of oil in 2 hours. Production in this well, and in the Antelope Creek wildcat is from basal Green River, which produces at Roosevelt and Red Wash. The 3 Unit is 6 miles southeast of The California Co.'s discovery at Gusher, which was completed about 2 years ago, later dropped to noncommercial production.

Interest in Pennsylvanian and other deeper horizons along the flanks of the Denver-Julesburg basin was spurred again this week by reports that a new wildcat, the C. H. Bigsby 1 Hill, C SW SE 36-11s-42w, in Wallace County, Kansas, has had shows, probably in Pennsylvanian. Complete information has not been released by the operator. The wildcat is about 6 miles east of the Cheyenne and Kit Carson County lines in eastern Colorado.

Continental Oil Co. has started a wildcat program along the southern and southeastern flank of the Denver-Julesburg basin in the Las Animas arch area. First of a projected series of four wells planned through the general area is 1 McClabe, SE SE SE 11-20s-49w, Kiowa County. The play follows shows in deeper beds in other wildcats along the arch. Continental has done extensive seismic work through the area.

In Cherry County, Nebraska, British-American Oil Producing Co. has location for 1 Leach, SE SE NW 23-31n-38w, in the general Chadron arch area, which has also had considerable attention in recent months. This is also a seismic location, and is located on a 62,000-acre selection from an 82,000-acre block held under option by the company in the general area.

Completion gage of 160 bbl. of oil per day on pump was reported from Gene Goff 1 Long, SW SW NW 15-12n-55w, discovery in the Long area of Kimball County, Nebraska. Production was from "D" sand with the formation topped at 6,090 ft.

Shell Oil Co. and Oceanic Oil Co. continue exploratory programs in the general Richey area of Dawson and McCone counties in Montana. Oceanic announced the last two of a series of three locations on farmouts from Shell in the area. The 1 Brown, C SE SE 24-24n-50e, is 8 miles northeast of the pool opener in the Richey field, in McCone County. 1 Normand, C SE SE 6-23n-50e, is 3 miles north of the Shell discovery in the area. Oceanic's first wildcat in the three-well program, 1 Casterline, C NE NE 4-22n-50e, is drilling below 7,012 ft. with top of Charles sampled at 6,826 ft.

Shell made location for 11-3 NP, C NW NW 2-22n-49e, McCone County, 4 miles southwest of the discovery well. The company's wildcat in the Duck Creek area of McCone County, suspended last week, is 10 miles southwest of the discovery.

In the Cedar Creek area to the south The Texas Co. is preparing to run casing on 1 NP "G" (NCT 2), C NW SW 21-16n-54e, following acidization of open hole above plugged-back depth of 9,647 ft. Results of acid treatment are unannounced, but apparently were of sufficiently commercial nature to warrant setting of casing and attempted completion.

Twenty-five miles west of the Cedar Creek field The Texas Co. has plugged 1 Maciorski, C NW SW 23-16n-50e, with bottom at 10,762 ft. Some staining was cored from 10,118-167 ft., with no shows or drill-stem tests. Top of Ordovician was logged at 9,820 ft. The wildcat is of interest as the first in the current play to go to this depth so far west of production at Cedar Creek

In North Dakota Amerada Petroleum staked six locations in furtherance of the intensive program under way in Williams County. Three poolers in Beaver Lodge field, one extension to this field, and two Tioga stepouts made up the list. In the Charlson area of McKenzie County, Amerada is preparing to test 1 North Dakota "D" after recovery of gas-cut mud from 8,732-8,895 ft. from Madison topped at 8,725 ft.

West of Beaver Lodge a 1½-mile stepout was staked by C. W. Williams and O. D. Clark of Shreveport. The well is Davidson 1, C SE SW 3-155n-96w. It is 1½ miles west of the Amerada 1 Nelson, C SE SE 2-155n-96w, apparently successful west extension of the pool, now swabbing at the rate of 73 bbl. of oil per day.

(Continued on page 434)

COST CUTTING COMBINATION

Truco DIAMOND BITS

D&S CORE BARRELS

Drilling & Service

3031 Elm Street Dallas 1, Texas

OFFICE PHONE: Riverside-6811
NIGHT NUMBERS: TRemont-5559, Victor-3708

Other Offices-Services

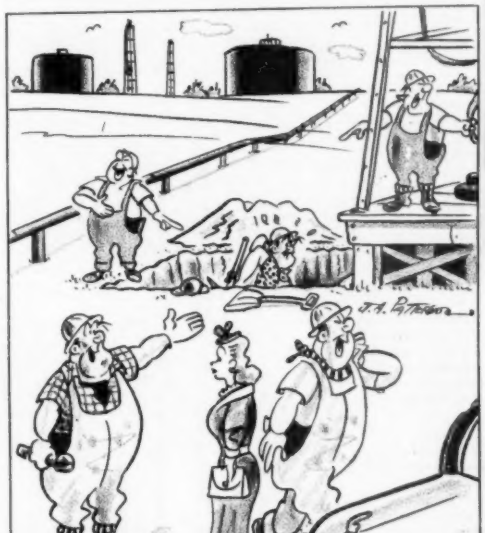
Tyler, Texas	2-2742	Shreveport, La.	5-5474
Odessa, Texas	6-6774	Casper, Wyo.	3739
Abilene, Texas	2-2790	Carmi, Ill.	7799
Victoria, Texas	3264	Ft. Morgan, Colo.	1143
Norman, Okla.	4360	Great Bend, Kans.	7995

Distributors

Diamond Drilling Co., 2759 E. Willow St., Long Beach, Calif., Telephone: Long Beach 40-7949
Allied Services, Inc., Mt. Pleasant, Michigan Telephone: 29-861

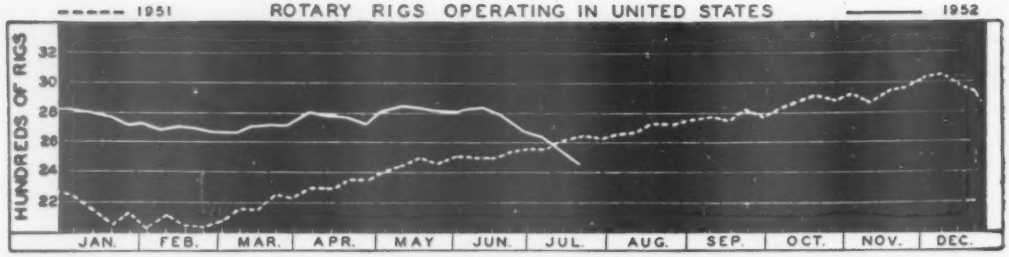
Foreign

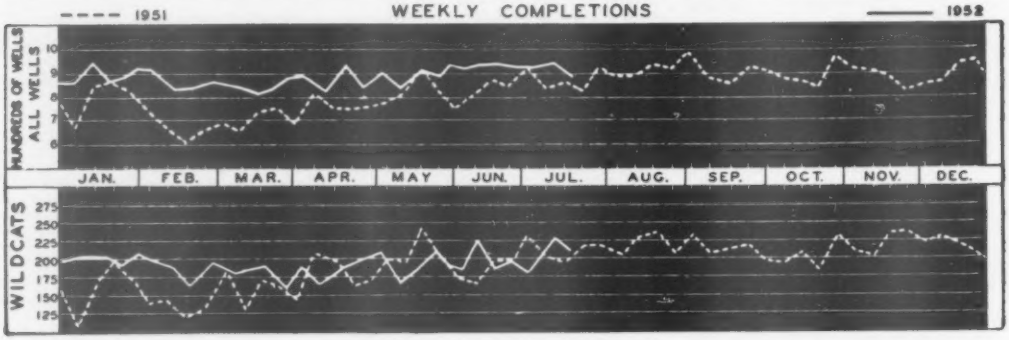
D. T. O'Connor, 500 Fifth Avenue, New York, N. Y.
Petroleum Industry Consultants, C. A., Caracas, Venez.
Denton - Spencer Co., Ltd., Calgary, Alberta, Canada.



THE OIL AND GAS JOURNAL

"You mean ex-Corporal Sneed—yes'm you'll find him right over there in his fox hole."





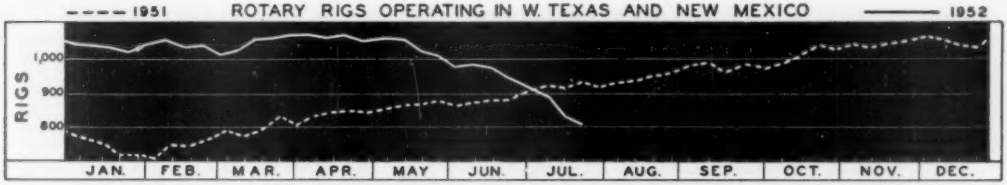
CURRENT STATISTICS

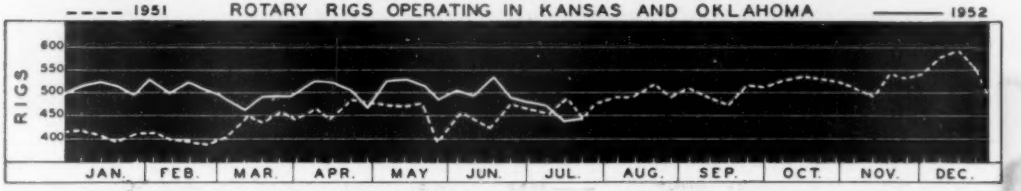
EXPLORATION

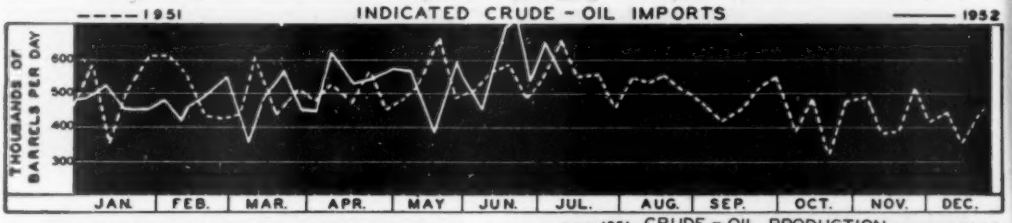
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 19, 1952

	Total of all wells					July 19		Wildcat completions and discoveries					Cumulative total, 1952				
	Comp.	Oil	Gas	Dry	Footage	1952	1951	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	17	8	0	*9	24,475	400	336	0	0	0	0	0	0	0	0	2	2
Pennsylvania	51	22	7	†22	100,000	994	882	0	0	0	0	0	0	0	0	2	2
West Virginia	7	0	6	1	26,033	347	311	0	0	0	0	0	0	0	2	3	5
Ohio	22	7	2	‡13	42,707	541	484	0	0	0	2	2	0	0	7	11	18
Indiana	41	10	2	§29	70,299	649	631	2	0	0	12	14	20	0	2	186	208
Kentucky	23	10	4	9	44,677	718	623	1	0	0	3	4	15	0	1	131	147
Illinois	51	20	0	31	125,133	970	1,249	1	0	0	15	16	9	0	0	275	284
Michigan	15	9	0	6	34,217	385	411	1	0	0	5	6	15	0	4	132	151
Kansas	73	28	9	36	259,106	2,643	2,383	0	0	1	17	18	58	0	9	415	482
Nebraska	3	2	0	1	18,112	135	128	1	0	0	1	2	6	0	0	73	79
Oklahoma	93	56	3	‡34	360,620	3,245	2,999	2	0	0	10	12	63	2	8	326	399
Texas	335	201	20	114	1,610,989	9,945	9,108	19	1	3	70	93	437	35	67	2,112	2,651
North Central (Dist. 7-B & 9)	125	68	1	¶56	426,350	3,108	2,768	13	0	0	37	50	247	1	22	884	1,154
West (Dist. 7-C & 8)	92	74	0	18	556,033	3,101	2,726	4	0	0	8	12	88	0	4	372	464
Panhandle (Dist. 10)	17	5	12	0	49,177	374	378	1	0	1	0	2	3	0	5	25	33
Eastern (Dist. 5 & 6)	24	14	2	8	131,634	522	687	0	0	0	5	5	15	3	1	116	135
Gulf Coast (Dist. 2 & 3)	36	21	3	12	236,558	1,475	1,282	0	1	1	7	9	47	21	15	306	389
Southwest (Dist. 1 & 4)	41	19	2	20	211,237	1,365	1,267	1	0	1	13	15	37	10	20	409	476
Louisiana	33	18	2	13	211,843	1,243	1,105	0	0	0	7	7	23	11	7	150	191
Northern	17	9	1	7	61,578	657	575	0	0	0	5	5	8	0	6	67	81
Southern	16	9	1	6	150,265	586	530	0	0	0	2	2	15	11	1	83	110
Arkansas	5	2	0	3	20,483	209	205	0	0	0	1	1	4	0	0	40	44
Mississippi	8	2	0	6	59,518	191	173	1	0	0	5	6	10	1	1	83	95
Southeastern States	1	0	0	1	7,678	35	31	0	0	0	1	1	1	0	1	21	23
Montana	3	2	0	1	14,716	142	110	0	0	0	1	1	2	0	1	29	32
Wyoming	17	8	0	9	82,021	386	395	0	0	0	5	5	16	0	3	60	79
Colorado-Utah	14	6	0	8	77,639	281	149	0	0	0	5	5	15	0	7	108	130
New Mexico	14	10	1	3	92,651	579	370	0	0	0	2	2	21	2	1	61	85
California	46	35	0	11	175,520	1,376	1,211	1	0	0	9	10	46	0	4	267	317
North Dakota	1	1	0	0	8,540	30	4	0	0	0	0	0	3	0	0	6	9
Miscellaneous (Md., Mo.)	5	0	3	2	8,754	44	53	0	0	3	2	5	0	0	14	18	32
Total United States	878	457	59	362	3,475,731	25,488	23,351	29	1	7	173	210	764	51	139	4,511	5,465
Total previous week	941	461	72	408	3,810,894			25	0	5	199	229	735	50	132	4,338	5,255
Total July 21, 1951	814	413	60	341	3,175,821			39	1	7	169	216	800	42	151	4,126	5,119

Service wells included: *9, †18, ‡2, §4, ¶1.



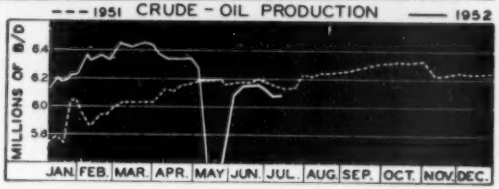


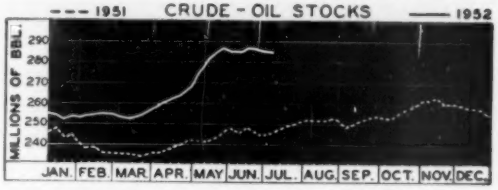


DAILY AVERAGE PRODUCTION FOR WEEK

	July 19, 1952			July 12
	Crude oil	Lease condensate	Total	total
Alabama	2,700	.....	2,700	2,600
Arkansas	76,900	4,000	80,900	81,100
California	987,100	.....	987,100	987,700
Colorado	83,600	.....	83,600	84,000
Eastern	57,900	.....	57,900	57,900
Florida	1,750	.....	1,750	1,750
Illinois	162,700	.....	162,700	164,100
Indiana	33,200	.....	33,200	31,500
Kansas	326,300	.....	326,300	325,000
Kentucky	34,300	.....	34,300	33,200
Louisiana	636,600	34,150	670,750	670,950
North	112,100	12,650	124,750	124,950
South	524,500	21,500	546,000	546,000
Michigan	37,600	.....	37,600	36,400
Mississippi	92,650	3,650	96,300	97,250
Montana	27,000	.....	27,000	27,100
Nebraska	7,300	.....	7,300	7,150
New Mexico	166,100	375	166,475	166,375
Oklahoma	521,200	.....	521,200	518,600
Texas	2,549,650	43,025	2,592,675	2,592,675
Dist. 1	31,675	125	31,800	31,800
Dist. 2	135,275	3,900	139,175	139,175
Dist. 3	409,425	24,500	433,925	433,925
Dist. 4	223,000	4,900	227,900	227,900
Dist. 5	50,075	250	50,325	50,325
Dist. 6	110,750	3,750	114,500	114,500
East Texas field	265,000	.....	265,000	265,000
Dist. 7-B	90,500	50	90,550	90,550
Dist. 7-C	135,575	5,050	140,625	140,625
Dist. 8	856,100	200	856,300	856,300
Dist. 9	161,175	300	161,475	161,475
Dist. 10	81,100	.....	81,100	81,100
Utah	4,200	.....	4,200	4,500
Wyoming	185,000	.....	185,000	188,000
North Dakota	3,600	.....	3,600	3,600
Total U. S.	5,997,350	85,200	6,082,550	6,081,450
Change from previous week, up			1,100	
Canada	205,250	.....	205,250	163,975

Cumulative figures to be resumed when complete totals for strike period are available.



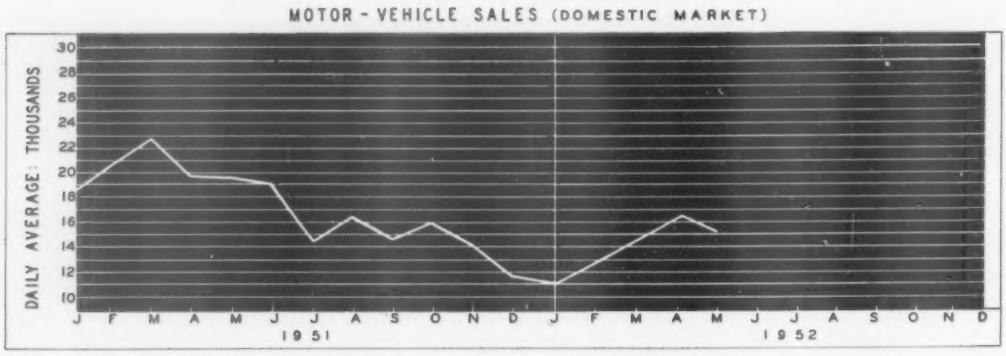


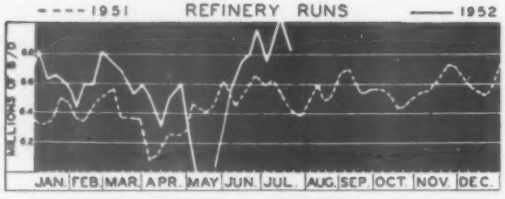
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

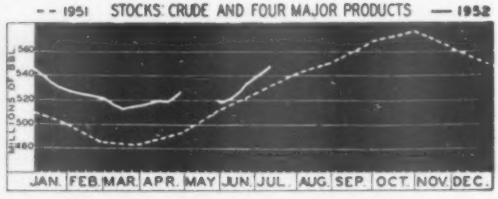
(Thousands of barrels)

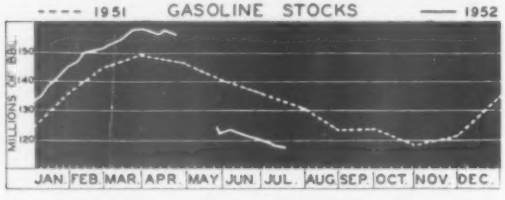
	July 12, '52	July 5, '52	July 14, '51
Pennsylvania Grade	2,296	2,228	2,131
Other Appalachian	1,971	2,134	1,517
Illinois, Indiana, Michigan	12,789	12,815	11,050
Arkansas	3,038	3,115	2,874
Louisiana	15,416	15,325	14,280
North	2,543	2,352	2,864
Gulf	12,873	12,973	11,416
Mississippi	3,352	3,480	3,102
New Mexico	7,831	7,542	6,605
Oklahoma and Kansas	43,716	43,621	37,431
Texas	139,119	140,345	115,574
East Texas proper	12,775	13,740	(†)
West Texas	61,153	62,020	(†)
Texas Gulf	30,704	29,943	(†)
Other Texas	34,487	34,642	(†)
Rocky Mountain	14,963	15,092	13,964
California	30,917	31,298	30,391
Foreign	8,400	8,524	8,846
Total	283,808	285,519	247,765

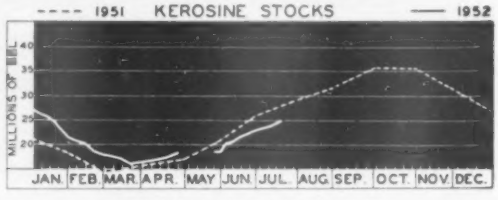
*Bureau of Mines. †Not comparable with current week.

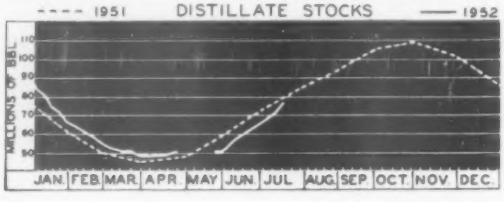


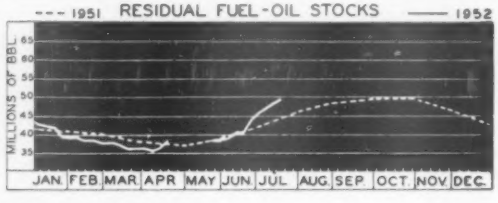










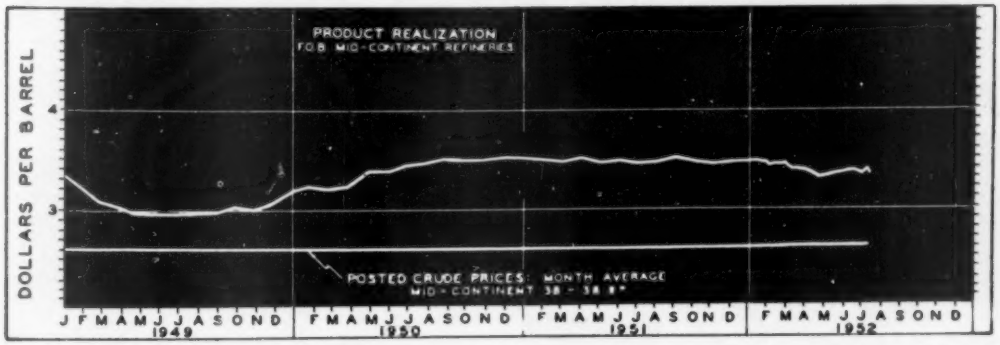


A.P.I. REFINERY REPORT, JULY 19

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1951 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,007	421.9	40.3	220.4	223.3	27,725	11,091	24,993	12,824	988	399.3	41.1	218.9	225.2
Appalachian:														
District 1	102	46.0	3.0	15.6	11.1	3,428	532	1,158	690	103	43.7	5.4	14.6	9.5
District 2	84	43.4	2.4	16.3	12.3	1,716	279	409	343	78	39.2	5.4	7.6	17.0
Ind., Ill., Ky.	1,306	701.9	74.9	234.3	150.8	24,296	5,121	16,246	6,597	1,212	636.4	73.0	195.8	159.6
Okla., Kans., Mo.	607	353.7	18.4	138.3	66.0	11,299	1,604	10,076	1,622	478	258.2	16.1	105.7	58.9
Inland Texas	268	169.3	12.7	48.0	38.7	3,883	480	1,549	983	259	167.9	12.7	39.8	40.4
Texas Gulf Coast	1,588	730.4	137.7	384.4	261.9	16,845	3,112	8,693	7,551	1,556	724.3	106.7	338.2	274.3
La. Gulf Coast	534	248.7	24.1	162.7	45.7	6,486	1,680	2,863	1,907	504	246.7	49.1	119.1	64.3
N. La. and Ark.	82	34.3	8.0	21.1	8.0	2,553	517	1,080	242	85	32.8	8.0	15.3	7.9
Rocky Mountains:														
New Mexico	19	10.7		2.9	3.9	98		56	32	15	8.5	.3	3.0	3.8
Other Rocky Mtn.	223	113.7	3.9	42.3	45.7	4,122	411	1,690	1,489	229	107.3	4.3	43.2	44.2
California	999	413.7	3.3	160.6	386.7	14,929	301	8,598	15,316	955	427.1	7.6	126.8	369.6
July 19, 1952	6,819	3,287.7	328.7	1,446.9	1,254.1	117,380	25,128	77,361	49,596	6,462	3,091.4	329.7	1,228.0	1,274.7
July 12, 1952	7,013	3,321.6	345.3	1,454.9	1,277.6	118,332	24,306	72,515	48,395					
July 21, 1951	6,406	3,051.9	353.9	1,245.9	1,280.4	131,483	28,773	79,709	44,970					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk plants, in transit and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
4
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1949
F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.32 for week ended July 12, $3.39 for previous week, and $3.48 for July 1951. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of July 23, 1952. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅜-10½	12.125-12.75	10¾-11
Premium gasoline, 86-88 octane	11⅜-11½	13.5-13.75	11¾-12
42-44 w.w. kerosine	8¾-9	10.65	9
No. 2 straw fuel oil	7¾-8	9.65	8
No. 6 residual	$0.90-1.00	$2.35-2.50	$1.65-1.75

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	27-28
200 vis., No. 3 neutral, 0-10 pp.	14.5-15.5

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	5.5

INCREASES in stocks of heavy fuel on the Gulf Coast indicate that most of the dirty storage space on the East Coast has been filled. Dirty tanker rates for Gulf-East Coast movement are down to about 10 per cent under the Maritime Commission base, and No. 6 is reported to be available in the Houston area at prices as low as $1.50 per barrel.

Any large consumers or distributors on the East Coast with additional space for residual can buy No. 6 on the Gulf Coast and deliver it to storage on the East Coast at costs that will make it profitable to hold the material until next winter when prices probably will be at ceiling levels.

Since current Gulf-East Coast tanker rates amount to about 40 cents a barrel for heavy fuel, good quality material can be delivered in New York Harbor for about $1.90 plus normal loss, insurance, and handling charges in the harbor.

There are a few indications of increased movement of light heating fuels in the Mid-Continent. Part of the larger movement may be due to increased shipments by major suppliers to their own secondary storage or to seasonal increases in deliveries to contract accounts as these accounts build stocks for the winter season.

An important indicator of increased movement is the decreasing availability of clean tank cars. While clean cars can not be classified as tight, they are not as readily available as they were early in July. Also stocks of kerosine and distillate fuels east of California are still 7,000,000 bbl. under last year.

Gasoline markets are strong in all areas. Gasoline stocks are lower than at any time in the fall of last year. Retail sales are down in a few industrial areas where the steel strike has reduced purchasing power, but the general market is still tight.

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93	....	....	....
19-19.9	1.98	....	....	....
20-20.9	2.03	$2.25	....	$2.12
21-21.9	2.07	2.27	....	2.14
22-22.9	2.12	2.29	....	2.16
23-23.9	2.18	2.31	....	2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.	
Kettleman Hills, California*	$2.80
Louisiana:	
Beauregard Parish	2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.25
Southwest Pennsylvania	3.82
West Virginia	3.76
Illinois Basin	2.77

*37°-37.9°.

June Completions Lowest Since February

by John C. McCaslin

JUNE total completions were the lowest since February, but were up 21 over last June. Total footage drilled was also the lowest since February, but up 11 per cent over last June. Oil-well completions were up 38 over last June, gas wells down 9, dry holes down 8.

June completions were down 381 from May with all classes of wells falling below May levels. Total oil wells completed were down 7 per cent. Gas wells completed showed a decline of 14 per cent. Dry holes completed showed a 9 per cent decline from May's levels. A total of 811 wildcats were drilled in June, 127 of them successful. Total wildcat footage drilled was 3,737,648 ft. Development footage drilled totaled 11,655,773 ft., the lowest since February.

Cumulative depth classification totals for 1952 show increases in all classes. A gain of 1 per cent was reported over last year in the under-2,500-ft. class. In the 2,500-5,000-ft. class a 6 per cent gain was noted. The 5,000-7,500-ft. class showed a 27 per cent gain over last year. A 50 per cent gain was recorded in the 7,500-10,000-ft. class. The 10,000-12,500-ft. class showed a substantial gain of 30 per cent over last year. The deepest class, over 12,500 ft., showed a 76 per cent gain. These gains reflect the ever-increasing trend toward deeper drilling, particularly in the classes above 7,500 ft.

Cumulative total completions in Alberta stand at 745, an increase of more than 40 per cent over last year. Total footage stands at 3,293,894 ft. Upon settlement of the steel strike in the United States, a boost in drilling activity is expected during the last half of 1952. Cutbacks in field development drilling have already been noted, but exploratory work is keeping a steady upward trend. A total of 143 wells were completed during June, the highest for the province this year. Wells were completed at the rate of more than four a day. June's totals were up 31 per cent over last June. Canadian crude-oil production reached an all-time high of 222,500 bbl. daily in June.

Completions in Texas were up 26 over last year. Footage drilled was up 13 per cent. A total of 362 wildcats were completed, 62 of them successful. Wildcat footage drilled totaled 1,782,381 ft. Total completions in Oklahoma were up 13 over last June. Operators finaled 53 wildcats, 12 of them successful, for a total wildcat footage of 238,193 ft.

SUMMARY OF COMPLETIONS, JUNE 1952

	Total comp.	Oil	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.	Total footage	Rigs and drilling
New York	66	33	0	33	65	1	0	0	0	0	97,900	75
Pennsylvania	206	91	30	85	169	30	7	0	0	0	399,456	210
West Virginia	55	4	43	8	20	33	2	0	0	0	166,885	220
Maryland	4	0	3	1	0	4	0	0	0	0	15,660	21
Ohio	90	44	20	26	43	47	0	0	0	0	198,255	157
Kentucky	108	29	12	67	65	43	0	0	0	0	221,709	95
Illinois	205	79	3	123	95	110	0	0	0	0	491,853	300
Indiana	97	40	0	57	81	16	0	0	0	0	171,376	232
Michigan	63	23	4	36	39	22	2	0	0	0	149,961	187
Kansas	408	226	19	163	55	342	11	0	0	0	1,387,100	474
Nebraska	22	6	0	16	0	15	7	0	0	0	96,163	25
Oklahoma	442	259	20	163	131	213	78	16	4	0	1,614,301	859
Texas	1,364	810	45	509	260	456	409	191	43	5	6,828,831	1,494
N. Central (Dist. 7-B & 9)	420	204	8	208	128	207	85	0	0	0	1,496,121	359
West (Dist. 7-C & 8)	459	352	1	106	43	108	198	86	20	4	2,737,825	485
Panhandle (Dist. 10)	37	21	13	3	5	31	0	1	0	0	118,104	97
East (Dist. 5 & 6)	64	34	3	27	6	27	19	11	1	0	344,343	98
Gulf Coast (Dist. 2 & 3)	177	107	5	65	14	29	58	62	14	0	1,183,060	266
Southwest (Dist. 1 & 4)	207	92	15	100	64	54	49	31	8	1	949,378	189
Louisiana	175	99	14	62	43	27	20	39	38	8	1,158,443	338
North	99	58	12	29	43	26	18	10	2	0	369,294	154
South	76	41	2	33	0	1	2	29	36	8	789,149	184
Arkansas	36	17	0	19	4	24	3	5	0	0	152,077	44
Mississippi	19	4	0	15	0	1	16	1	1	0	130,718	30
Ala.-Ga.-Fla.	7	1	0	6	0	1	5	1	0	0	44,394	6
Montana	26	14	1	11	15	9	2	0	0	0	68,260	110
Wyoming	56	36	2	18	3	19	23	8	2	1	320,643	171
Colorado	38	10	2	26	1	8	26	3	0	0	212,153	45
Utah	3	1	0	2	0	1	0	1	1	0	23,194	39
New Mexico	90	49	20	21	15	32	9	18	10	6	529,983	232
California	192	138	4	50	55	65	41	18	11	2	854,731	258
North Dakota	6	4	0	2	0	0	1	4	1	0	53,676	25
Miscellaneous	§3	0	0	3	2	1	0	0	0	0	5,699	¶18
Total June 1952	3,781	†2,017	242	*1,522	1,161	1,520	662	305	111	22	15,393,421	‡5,665
Total May 1952**	4,162	2,195	281	1,686	1,253	1,673	719	353	132	32	17,295,309	5,521
Total June 1951	3,760	1,979	251	1,530	1,341	1,559	572	200	76	12	13,815,957	5,329
Cumulative 1952**	23,193	12,457	1,548	9,188	6,966	9,333	4,255	1,785	696	158	95,807,860	.....
Cumulative 1951	20,766	11,215	1,373	8,178	6,856	8,748	3,348	1,190	534	90	79,732,958	.....
Alberta, Canada:												
June 1952	143	79	14	50	20	63	56	3	1	0	619,046	.....
May 1952	128	79	11	38	17	46	62	2	1	0	556,316	.....
Cumulative 1952	745	442	57	246	97	277	355	12	4	0	3,293,894	.....

*Incl. 138 service wells: N. Y. 32, Pa. 74, Ohio 4, Mich. 7, Kans. 10, Okla. 7, N. Cent. Tex. 1, S.W. Tex. 1, Calif. 2. †Incl. 29 condensate wells: Okla. 3, W. Tex. 3, Tex. Gulf Coast 7, S.W. Tex. 7, S. La. 6, N. Mex. 1, Calif. 1, Wyo. 1. ‡Incl. all wells rigged up and/or drilling at month end. §Incl. 1 Ariz., 3,544 ft., 2 Mo., 2,155 ft. ¶Incl. S. D. 8, Idaho-Ariz.-Nev. 5, Mo. 5. **Revised.

EQUIPMENT MEN . . . in the News

Allis-Chalmers Announces Vice President Promotions

R. S. STEVENSON

R. S. Stevenson was elected executive vice president of the Allis-Chalmers Manufacturing Co. at a recent monthly meeting of the firm's board of directors, according to W. A. Roberts, president. Stevenson, prior to his new appointment, was vice president in charge of the Tractor Division.

The board elected Willis G. Scholl, formerly vice president and general sales manager of the tractor division,

W. G. SCHOLL

F. MUSSELL

to succeed Stevenson. Named to succeed Scholl as vice president and general sales manager was Frank Mussell, eastern territory manager of the tractor division.

Stevenson has been associated with Allis-Chalmers tractor division since 1933 when he joined the Kansas City branch as a salesman. Scholl joined the company in 1936 as a salesman for the tractor division's branch at Columbus, Ohio. Mussell came to Allis-Chalmers in 1936. He started with the company as a blockman in the firm's Des Moines branch of the tractor division.

Oil Well Supply Opens New Store at Corpus Christi

The opening of a new store of Oil Well Supply Division, U. S. Steel Co., at Corpus Christi, Tex., has been announced by Melvin F. Jones, manager of the division's Gulf Coast area.

Manager of the new store is Chester L. Vines, who has served as manager of Oilwell's Mission, Tex., store since August 1950. Vines joined Oilwell in 1948 as a storeman in the Alice, Tex., store. Three months later he was promoted to field representative at Rockport, Tex., and held that position until his appointment as manager at Mission.

Other personnel in the new Corpus Christi store include Raymond T. Cheney and Wallace D. Newman, both field representatives.

Metal Goods Names Gribble To New Managerial Position

Metal Goods Corp., of Houston, a division of Metal Goods Corp., St. Louis, recently announced the appointment of Charles G. Gribble, Jr., as manager of sales, Houston division.

Gribble has served a total of 15 years in the metal-working and metal-processing industries. He joined Metal Goods in February 1946 as a sales representative.

In addition to sales administrative duties, Gribble will have the responsibility of seeing that the sales and technical services of Metal Goods Corp. keeps pace with its rapidly expanding volume of business.

Houston Nomads Have Barbecue at La Porte

On June 16 the Houston Chapter of Nomads was entertained by Nomad Charles M. Smythe at his bayshore home at La Porte. With temperatures ranging in the low nineties in Houston, the bayshore breezes were a welcome relief to Houston Nomads and their wives. No business meeting was held, but guests enjoyed a barbecue supper.

Enjoying the outing at the home of Nomad Charles M. Smythe are host, Nomad Smythe; foreign guest, Dr. Manuel Mier, Empresa Colombiana de Petroleos, Bogota, Colombia, S. A.; and Nomad W. A. (Red) Davis.

Grumbaugh Is Named to New Engineering Post

Kennametal, Inc., Latrobe, Pa., has announced the appointment of Lee Grumbaugh as sales development engineer in the petroleum industry. His duties include the development and marketing of balls and seats, applied carbides for cone bits, and applications where Kennametal can be used to advantage to reduce maintenance and parts replacement cost.

Grumbaugh has served the petroleum industry for 25 years. He has since been an oil operator, specializing in well rehabilitation at Signal Hill, Calif., has worked as development and sales engineer on drilling and pumping equipment, as consultant, and more recently he operated his own steel and pipe supply company in Colombia, South America.

C. R. Cross is Named Development Engineer

C. R. CROSS

Curtis R. Cross has been appointed development engineer for BJ Service, Inc., Long Beach, it was announced recently by John B. Merritt, vice president and general manager of the company.

Cross was formerly superintendent of tools for Spartan Tool & Service Co. of Houston, and has been associated with Baker Oil Tools, Inc., of Los Angeles, and Halliburton Oilwell Cementing Co.

Mud Products Names Gulf Coast Representative

Mud Products, Inc., Tulsa, has named Henry H. Paris Distributor, Inc., Houston, as Gulf Coast representative for Mudco O-Ring Butterfly Valves. The announcement was made by R. D. Baker, manager, equipment division. This new representative will serve all of Louisiana and Texas, with

the exception of West Texas and the Texas Panhandle, and they will carry a complete stock of Mudco O-Ring Butterfly Valves and parts.

Crane Co. Adds Laird To Engineering Staff

Hubert C. Laird, until recently vice president of Otis Engineering Corp., joined Crane Co. on July 1 as field engineer to expand the company's services to the petroleum industry. Laird will concentrate on the valve and fitting problems of petroleum production, and will work from the engineering division headquarters at the large Crane Co. Chicago plant.

In 16 years with Otis Engineering and Otis Pressure Control, Inc., Laird worked as a field engineer, design engineer, and chief engineer before being named vice president in charge of manufacturing.

Laird received his engineering degree from Oklahoma A. & M. in 1933.

Rapier Joins Bethlehem As Engineering Representative

James R. Rapier has joined Bethlehem Supply Co., as engineering representative with headquarters in Tulsa. Rapier has had 16 years' experience in the compressor and pipe-line pump field, and in his new position he will continue along similar lines throughout the Mid-Continent area.

Travis Brown to Represent Hunt Export In Venezuela

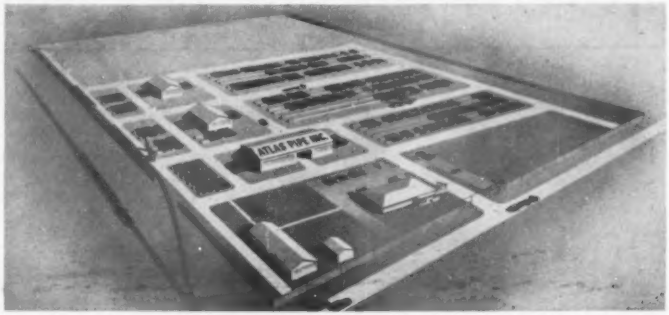
Travis A. Brown has been appointed by the Hunt Export Co. as its representative in Venezuela, with headquarters in Caracas. Brown was previously associated with a major oil company in Venezuela.

Brown will handle all tools and equipment distributed by Hunt Export.

W. A. Schlueter Presents Engineering Scholarship

W. A. Schlueter, Refinery Supply Co., Tulsa, has presented to Dr. G. L. Cross, president of the University of Oklahoma, another $1,000 scholarship to be awarded to a worthy student in chemical engineering. It is the fifth to be presented as the William A. Schlueter Fellowship Award.

Atlas Pipe Builds New Pipe Finishing Facilities



Atlas Pipe, Inc.'s, new pipe-finishing plant at Houston.

Atlas Pipe, Inc., a Texas corporation, is completing the first four mill-type buildings to house machinery for upsetting, threading, coupling, and testing oil-well tubing, casing, and line pipe. The plant is being constructed on a 45-acre site at 7707 Wallisville Road, Houston.

Designed by John A. Stiranka, engineer, formerly with National Tube Co., Pittsburgh, this plant embodies the most advanced ideas in machinery and pipe-handling equipment. Pipe mills, generally, can manufacture much more pipe than they are able to finish. This Houston "finishing plant" added to present mill capacity will aid in increasing the flow of pipe to the oil fields. Completion of the present program is expected by September.

Atlas Pipe, Inc., is presently operating its own pipe yard and shops at Corpus Christi, Tex.

McCullough Tool Announces Four New Store Locations

Melvin Sisk, second from left, manager of the Sherman, Tex., Chamber of Commerce, welcomes McCullough Tool Co. to Sherman at recent open house at the new McCullough branch. Shown with Sisk are: Clarence Robertson, district manager; Sisk; Bob Smith, eastern division public relations director; and James Mitchell, branch manager of the new McCullough sales and service center.

McCullough Tool Co. has announced the opening of four new Texas service branches. The branches, located at Sherman, Beaumont, Luling, and Hadacol Corner, will enable McCullough to give better service to the rapidly expanding Texas oil operations in their respective area. This raises the total McCullough branches in the United States and Canada to 36, with 16 branches in major Texas oil fields.

James E. Mitchell was appointed branch manager of the new Sherman sales and service center where an official grand opening was held recently. Approximately 100 civic and community leaders, led by Melvin Sisk, manager of the Sherman Chamber of Commerce, attended the open house, as well as Clarence Robertson, district manager, and Bob Smith, public-relations director of the McCullough eastern division headquarters.

The Beaumont branch is under the jurisdiction of V. M. Hocut, district manager, while D. M. Glass has been appointed branch manager at Luling and Sam Jones branch manager at Hadacol Corner.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 15c a word one issue. 10% Discount three or more consecutive issues. $3.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EQUIPMENT FOR SALE

PIPE
All sizes; line pipe and casing, tanks, and Oilfield supplies. Edco Pipe & Supply Co. Phone 45970, P.O. Box 151, Tulsa, Oklahoma.

FOR SALE: Good 3½" and 4½" OD Drill pipe. Two EKU Waukesha's, One RL Cardwell, Hercules Engine, Tanks, Treaters, Pumping units. Rogers Pipe & Supply Co., 620 Wright Bldg., Tulsa, Oklahoma.

FOR SALE: Two five thousand barrel capacity and two twenty-five hundred barrel tanks. Immediate delivery and prompt erection. Atlas Tank & Steel Co. Phone 4-7492 or write P.O. Box 2297, Tulsa, Okla.

WELL drilling equipment, new or used. Spudders, rotaries, core & shot hole drills, tools, pipe, bits, blocks, pump jacks, valves. Everything for well drilling and service. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FRANKS Model "East Texas" double clutch truck mounted, truck motor driven well servicing unit; mounted on K-11 International 1948 Truck; equipped with 8 x 10 x 62' single pole mast. Good condition. $8 000 or $9.500 complete with tools. Box E-860, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE
GAS COMPRESSOR CYLINDERS
1—26" x 20" Compressor Cylinder
1—24" x 20" Compressor Cylinder
1—18" x 20" Compressor Cylinder
All above units are complete and in good operating condition and located in Benton, Illinois.

PIPE
20,000 ft.—8⅝ O.D. x .188 Wall—S.R.L. P.E. Bev.
75,000 ft.—2⅜ O.D. x .154 Wall—S.R.L. P.E. or T & C
1764 ft.—24" Class 200—B.&S.—Cast iron pipe
964 ft.—18" Class 200—B.&S.—Cast iron pipe
1634 ft.—14" Class 200—B.&S.—Cast iron pipe
900 ft.—12" Class 200—B.&S.—Cast iron pipe
468 ft.—8" Class 250—P.E. Cast iron pipe
Above pipe located in Kansas City.

BROWN-STRAUSS CORPORATION
1546 Guinotte Kansas City, Mo.
Norman Strauss Phone HArrison 1000

EQUIPMENT FOR SALE

FOR SALE: One 36-L Bucyrus-Erie drilling machine, complete with tools. Also 1,942 ft., new 7 inch, 17 lb., H-40, range 2, seamless casing and 2,409 ft. of new 2⅜ inch, 4.60 lb., range 2, J-55, seamless regular tubing. Box E-812, The Oil and Gas Journal, Tulsa, Oklahoma.

1—36-L Bucyrus Erie Spudder, equipped with Waukesha Mtr., tool house, Junk Rack, Light plant, wire lines, all in good condition. Write R. L. Jeffries, P. O. Box 724, Evansville, Indiana.

FOR SALE: One Code Oil Field Boiler; 110 HP, 150# WP "Oilwell Supply." Good condition. Oklahoma State approved, papers available. Price $800.00. Kinslow Power & Equipment Co., 817 So. Boulder, Tulsa, 14, Oklahoma.

FOR SALE: D-13,000 Caterpillar Diesel, skid type, 85% good as new condition, $3,000. Too large for our Spudder. Hazel & Garrett, Drilling Contractors, Caney, Kans. Tel. 116.

for
VALVES • FLANGES • FITTINGS
it's
Newman's Inc.
"One of the Southwest's Leading Distributors"
Tulsa, Okla. P.O. Box 1865 Ph. 25228-LD 635

NEW IMPORTED SEAMLESS J-55

Regular monthly shipments Prime, API, 5½" OD and 7" OD casing. Hunt or Moody inspection. Performance bond furnished guaranteeing shipment.

BARON TUBE COMPANY
722 Oliver St. N. W., Atlanta, Ga.
Importers of Casing & Tubing
Phone Atwood 8721-2

EQUIPMENT FOR SALE

10,000' 4½" API Full Hole Drill Pipe tested by Sonoscope engineers, also 1075' 6⅝" OD 36# Drill Pipe, like new. Milford Giffin, Tel. 477, Hoisington, Kansas.

PRITCHARD Model DBW 46-10 24' 4" wide x 65' 4" long x 45' 10" high, 10 bay atmospheric Cooling Tower, with 14 atmospheric sections. Call 4-0130, Tulsa, Oklahoma.

FOR SALE: Cardwell Model RL double drum rotary drawworks with spudding attachments with Cat D13,000 power, less than one year old, rated at 4500' depth. Equipped with 93' Lee C. Moore cantilever derrick, Wheland 7¼ x 14 mud pump with Waukesha NKU6 power. Rig completely equipped with new material March 1952. Includes three steel dog houses, 3500 W Koelher light plant, butane and diesel fuel tanks, 210 barrel water tank, 72 barrel water transport tank, 1952 Int. L194 oilfield truck with bed and winch, 1952 Hobbs tandem float and 1952 Nabors single axle float, Reed Wire line coring equipment, six 5¾" drill collars and approximately 4400' of extra hole drill pipe. All necessary hand tools, slips, elevators, and gauges included, including approximately 25,000' new tubular goods. Rig now located southwest of Cisco, Texas. T-H Drilling Corp., Lubbock Nat'l. Bank Bldg., Lubbock, Texas.

FILTERS for Oil Clarification
2—Sperry 18" x 18" Filter Presses, plate and frame, closed delivery, 11 chambers, ½".
1—Tolhurst 48" center slung Chip Wringer, 7½ hp. Motor.
CONSOLIDATED PRODUCTS CO., INC.
17-29 Park Row New York 38, N. Y.
BArclay 7-0800

PRESSURE VESSELS Immediately Available

8—10' ID dia. x 40' x 3" shell. Heads 3½". Test Pressure 900 psi. WP 600 psi.

5—10' ID dia. x 40' x 2½" shell. Heads 3". Test Pressure 750 psi. WP 500 psi.

8—8' ID dia. x 40' x 2" shell. Heads 2¼". Test Pressure 750 psi. WP 500 psi.

1—6' ID dia. x 40' x 2" shell. Heads 2¼". Test Pressure 750 psi. WP 500 psi.

All used, good condition, seam to seam, welded code construction. Built by A. O. Smith Corp. Located near Chicago, Ill. Prints, prices available on request.

WIRE—PHONE—WRITE

KINSLOW POWER & EQUIPMENT CO.
817 So. Boulder, Tulsa, Okla.
Phone 5-5914

DIESEL ENGINES — GENERATORS — COMPRESSORS

4—STERLING VIKING Diesels—Model VDS8—650 HP—1200 RPM.
2—VENN-SEVERIN Diesel Generators—200 K.W.—3 PH—60 Cy. 240 Volt.
1—VENN-SEVERIN Diesel Generator—125 K.W.—3 PH—60 Cy. 240 Volt.
1—ERIE Boiler—150 H.P.—150#—Portable—Firebox Type.
1—SULLIVAN 536' Compressor—Direct Connected to Caterpillar Diesel D 13000—Skid Mounted.
2—CATERPILLAR 75 K.W. Diesel Generators—3 PH—60 Cy.—220 Volt.
1—Welder 300 AMP. G.E. Caterpillar D3400 Engine—Skid Mounted.

ALL ABOVE EQUIPMENT LATE TYPE—IN EXCELLENT CONDITION

Large Stock Used Structural Steel, Pipe, Machine Tools, New and Used

JOSEPH BEHR & SONS, INC.
1242 Seminary Street Rockford, Illinois Phone 2-7721

EQUIPMENT FOR SALE

TWO truck mounted water well rigs with Ford motors pulling rigs capable of drilling 1100 feet small hole. 4 x 6 mud pumps; one with 2⅜ rods; other with 2½ upset tubing with tool joints on every joint. Both in operation when owner injured. $6500 or can be bought separate. Ben Wilson or Victoria Pipe & Supply, Victoria, Texas.

FOR SALE: 160 to 20,000 Acres State Oil Leases in Roosevelt, Quay, Hidalgo, Otero and Socorro Counties in New Mexico. Frank Sunseri, 1366 S. Mansfield Ave., Los Angeles, Calif.

ROTARY Drilling Rig complete. Steel Mast. Roller bearing throughout. 2000 ft. capacity. Two men operate. Well built. Shallow drilling, reverse circulation, clean out. Box 106, Seminole, Oklahoma.

FOR SALE: 48-L Bucyrus-Erie, Trailer Mounted, Waukesha WAK Motor. 36-L Bucyrus-Erie, Trailer Mounted, Waukesha GK-140 Motor. RL Double Drum Cardwell, Skid Mounted, Waukesha GK-145 Motor. Dog Houses. Light Plants and Tremendous stock of Drilling and Fishing Tools. All equipment in first-class condition and ready to work. Will sell tools or any item separately. Special price to one purchaser for all equipment. This is worth investigating. Box 337, Farmington, New Mexico, Phone 429-W.

3280' 7-inch—24 lbs.—10 thd. lapweld casing at ceiling price. Jay Kornfeld, 1121 Union National Bank Building, Wichita, Kansas. Phones—42121—60996.

LARGE Oilwell No. 76 Rotary, standard equipment, including 40 inch Parkersburg Hydromatic brake, 2 Waukesha Lrou engines, 218P Oilwell power pump, 7X14 Oilwell power pump with Waukesha NKU engine, three steel mud tanks, 4½" full hole drill pipe. Purchased new in December 1951. Will sell with or without 131' L. C. Moore Mast and 9' substructure. Box E-877, The Oil and Gas Journal, Tulsa, Oklahoma.

WILSON Super Double Drum Spudder with Twin Legged Mast, Sandline, Drilling Line, 5" and 6" Tools. Complete Outfit. B & G Well Service, Winfield, Kansas.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

NEW STEEL TUBING

10,000 feet—4" O.D.
10 gauge wall
Electric weld
20' lengths

10,000 feet—4" O.D.
9 gauge wall
Electric weld
with coating of asphalt and tar
inside and out
40' lengths

60,000 feet—1" O.D.
18 gauge wall
Electric weld
20' lengths

26" O.D. NEW STEEL PIPE
Continuous Electric Weld
.281" wall
Approximately 40 joints 40' each

All or any part of the above available for immediate shipment below warehouse prices. Subject to prior sale.

Write—Wire—Phone

Sonken-Galamba Corp.
2nd and Riverview (X-844)
Kansas City 10, Kansas
THatcher 9243

EQUIPMENT FOR SALE

2 MAYHEW Drills #1000 on or off contract. Slightly used. Complete. Box E-875, The Oil and Gas Journal, Tulsa, Okla.

BONANZA A-33. Serial D1776 NC 451B. 460 hrs. aircraft and engine. Painted white and blue with nose, wing tips and tail red. Constant speed plastic prop. Gyro compass, artificial horizon. Radio, Mitchell omni avigator with transmitter, Lear ADF with transmitter, ARC receiver, all radios VHF. In addition, have spare remanufactured engine 205 HP E20 starter. Price $13,000.00. Floyd C. Ramsey, 605 Melba Building, Dallas, Texas.

RUSKA Type "V" Magnetometer for Sale. Guaranteed perfect condition, $1500.00. W. R. Godfrey, 4108-A S. Rockford, Tulsa. Pho. 72-1192.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE: Two Kewanee Boilers, 150 HP, 200# WP. New Flues and Stay Bolts. Located at Del Rio, Texas. D. D. Thomas, San Angelo Natl. Bank Bldg., San Angelo, Texas.

83 STAR Speed Spudder Semi-trailer mounted, Complete with tools for 5 and 7" hole, Good wire, propane equipped, Kohler light plant, dog house, and all hand tools. Rig completely rebuilt and priced to sell. Call: Charles V. Cross, Phone 125, Madison, Kansas, or Herbert H. Hart, Phone 1571-W, El Dorado, Kansas.

FOR SALE OR TRADE: 17,000' 6⅝" OD Lapweld Casing. 8,000' 7" OD 17# & 20# Lapweld Casing. For information contact Deep Rock Oil Corporation, Don Auld at Garnett, Kansas, or Joe A. Huitt, Tulsa.

FOR SALE: 1-43C Heavy Duty Star Spudder A-1 Condition, complete with 10" to 5" Tools, Diesel Power and all necessary equipment to drill wells. Contact A. H. Alcock, Box 146, Office phone #301, Res. phone 2270, Chanute, Kansas.

FOR SALE: 600 feet drill pipe 2⅞" O.D. x 20 feet 3⅜ O.D. Tool joints—2⅜ IF Thread, A-1 Condition—$2.50 per foot. Circle Drilling Company, 220 Mayo Bldg., Tele. 2-9489, Tulsa, Oklahoma.

FOR SALE: One 4'0" ID x 40'6" x 11/16" shell Tower. Hastalloy lined, no trays. 250# WP for vertical erection. Price $1,500.00. Kinslow Power & Equipment Co., 817 So. Boulder, Tulsa 14, Okla.

FOR SALE

Miscellaneous Used Drilling Equipment, including Cable Tools:

6—Parkersburg 36" and 40" Single Hydromatic Brakes
2—40" Parkersburg Double Hydromatic Brake
4—EM-360 Regan Crown Blocks
1—Emsco type A77 Crown Block
1—Emsco Double Deck C-87 Crown Block
2—121" 6 sheave Regan Crossing Blocks
4—Martin Decker Weight Indicators
1—17½ Gumbo Buster Rotary Table
2—20½" Emsco JCS Rotary Tables
2—3¼" Kellys
1—6" Kelly
3—300 Tons B.J. Hook Connectors
2—150 ton Oil Well Swivels
2—UB-54-10 Draw Works
4—10 x 5 x 10 O.W. & Ideal Feed Pumps
1—Emsco ED Draw Works
7—15½ x 8½ x 20 Ideal Slush Pumps
6—14 x 7¼ x 14 G.D. Slush Pumps
4—12 x 12" Single Engines
4—12 x 12" twin Engines
5—14 x 14" twin Engines
3—16¼ x 7¾ x 20" O.W. Slush Pumps

and miscellaneous Well Head Equipment to be sold on Bid Basis; bids to close August 15. Contact:

STANDARD OIL CO. OF CALIFORNIA
Taft, California
Phone Taft 52111—G. L. Houck

EQUIPMENT FOR SALE

FOR SALE: Failing "1500" Holemaster powered by Chrysler industrial power unit, mounted on 1942 GMC truck, Rig complete with mud pump, 1000' of "N" rods, drill collar and core barrel, slips, elevators, subs, etc. Equipment showing very little use. 1—1942 GMC water truck, A-1 condition. All equipment $18,000.00. For inventory contact Box 409, Del Rio, Texas.

1 SUPERIOR 90 hp. twin gas compressor and 1 Superior 90 hp. twin gas engine. Alfred B Kern, 223 Wright Building, Tulsa, Oklahoma.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WE BUY well drilling equipment machines, cable tools, pipe, etc. Turn your surplus equipment into cash. Pressey & Son, Pueblo, Colorado.

WANTED: Heat Exchangers Approximately 500 to 1000 Sq. Ft. Send Price and Full Particulars. Northwestern Refining Co., St. Paul Park, Minnesota.

WILL pay cash for your surplus equipment — Engines, Generators, and Electric Motors. Brazos Engineering Co., Inc., 224 Raines Street, Phone FAirfax 8367, Houston, Texas.

WANTED to buy — small producing oil wells in Kansas. Box E-876, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: 400 to 1000 feet good used 6⅝ Drill pipe. Harold P. Doty, Box 503, Garden City, Kansas.

WANTED: Used casing, tubing, pumping equipment, 50 foot diamond core barrels and bits. Goodall Elec. Mfg. Co., Oil Division, Ogallala, Nebraska.

WANTED: Will pay cash for good used draw works, also complete drilling rigs. Goodall Elec. Mfg. Co., Oil Division, Ogallala, Nebraska.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale? Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

HELP WANTED

METHODS and Procedure Manager, large independent integrated oil company, age 26-35, good opportunity for right man. Information submitted by applicant must include education, previous employment, salary expected and recent picture. Box E-857, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC PERSONNEL needed for United States and Canada by well known and expanding contract geophysical company. Address Box E-863, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced Rotary Drillers for Large Diameter Holes by Large Water Well Drilling Concern Operating in Minnesota. Give References and Full Data in First Letter. Box E-888, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Refinery instrument repair man. Must be qualified to repair and maintain all types of refinery instrumentation. State age, qualifications and desired salary when applying. Box E-867, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF GEOLOGIST for strong Independent. 8-10 years experience Oklahoma-Kansas at supervisory levels. Know seismic work, analyze deals, promotions from both geologic and economic standpoint. $12,000 or better to start, plus personal royalty play. All applications confidential. Professional Service, 516 University Bldg., Denver, Colorado.

HELP WANTED

50 OIL INDUSTRY POSITIONS now open in Rocky Mtn. Area for qualified engineers, geologists, draftsmen, seismic crews, etc. Professional Placement Service, 516 University Building, Denver, Colo.

LANDMAN—Independent oil company has opening for experienced landman in Mid-Continent Area between ages of 30 and 40. Major company training preferred. In replying, give full particulars regarding education, experience, and qualifications. All replies confidential. Box E-874, The Oil and Gas Journal, Tulsa, Oklahoma.

SAN FRANCISCO CPA firm requires a senior or supervisor, preferably experienced with petroleum industry problems. To a person with competence and initiative, able to assume responsibility, this position offers opportunity for partnership interest. Give age, resume of education, employment, family status. Send snapshot. Box E-859, The Oil and Gas Journal, Tulsa, Oklahoma.

GRAVITY Party Chief, operators and surveyors with experience in South America. Top salary for the right men. Present personnel advised of this ad. Box E-843, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Mechanical Engineer to Supervise Drilling Crews for the Construction of Large Diameter Water Wells. Call on Municipalities and Industries—To Negotiate Contracts—Must Be Thoroughly Experienced and Capable—Good Salary and Insentive System—Give Past Record—Your Letters Held Confidential. Box E-887, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL INDUSTRY Employment Service, 405 Tuloma Building, Tulsa, Okla. 4-5974. Tom Robinson, owner. (Having success placing experienced LPG men).

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 434 Frick Bldg., Pittsburgh 19, Pa.

THE POSITION YOU WANT: Oil industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

WANTED

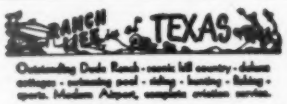
The following experienced personnel for new gas transmission company outside of Mid-Continent and S. W. areas. 800 miles of pipe line, 26" and down. Comptroller, General Superintendent. Salaries open. Box E-869, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL ANALYST

Unusually attractive opportunity in investment research department of Boston financial management firm for man under thirty-two with good background in oil economics and familiarity with oil industry statistics or analysis of oil company financial reports. Writing ability and training or experience in geology or finance desirable. Will provide excellent opportunity to develop in investment and financial phases of the industry.

Box E-881, The Oil and Gas Journal, Tulsa, Oklahoma

RESORTS


RANCH LIFE in TEXAS
Outstanding Dude Ranch - scenic hill country - delicious cuisine - swimming pool - riding - hunting - fishing - sports. Modern Airport, complete aviation service.
Write for folder, rates.
Flying L Ranch
BOERNE, TEXAS

SITUATIONS WANTED

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628. Ph. No. 3-3141, Hobbs, New Mexico.

WOMAN with 2 years Texas University, 5 years office experience wants position operating Bruning or blueprint machine, Leroy lettering, tracing, typing, filing, in Dallas. Well qualified. Permanent. Box E-881, The Oil and Gas Journal.

PETROLEUM GEOLOGIST, 32 years old, land department scouting, oil properties valuation, subsurface mapping, and general oil field operations experience in South and West Texas, desires employment with aggressive independent having active exploration program. Will Relocate. Box E-866, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR Engineer, desires job with major or substantial independent, age 34, experience in reservoir studies, valuation, reserve estimates, pressure maintenance, cycling, and unitization problems in Texas. Box E-868, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND MAN—More than 20 years experience with both major and independent companies in field and office. Thorough knowledge of titles, contracts and division orders. Best of references. Age 44, married. Box E-873, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERINTENDENT. Graduate Petroleum Engineer. 12 years responsible experience producing industry. Geological ability. Mid-Continent or Rocky Mountains. Box E-774, The Oil and Gas Journal, Tulsa, Oklahoma.

Petroleum Engineer, University of Texas, 5 years Refinery processing, 4 years refinery designing and construction, 2 years sales engineering. Desires lubrication or engineering sales, process design work, or refinery engineering. Prefer Tulsa, Gulf Coast, Dallas area. Box E-847, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer 27 single three years field production experience in South America desires position with small independent. Box E-853, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer, graduate, 2 years Business Administration. Experience: 5 years in office and field management. 3½ in finance with Armed Forces, 4 as field engineer. Employed, desire change. Age 36, married, no children, foreign location considered. Box E-878, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—Sixteen years excellent production engineering experience, desires change. Graduate engineer. Southwest preferred. Box E-879, The Oil and Gas Journal, Tulsa, Okla.

GEOLOGIST wants partner in oil development program. This is a good opportunity for one wanting to invest in this industry. Interview will be arranged and references furnished. Box E-880, The Oil and Gas Journal, Tulsa, Oklahoma.

WELL educated versatile woman, experienced recreational director. Member Dancing Masters of America. rapid typist, pleasant personality, wants position in Public Relations, Employee Relations or Publicity. Box E-883, The Oil and Gas Journal, Tulsa, Oklahoma.

JOB WANTED as sales engineer, Odessa, Texas. Age 26, married, graduate, 3 years' sales experience. W. G. Leggett, 301 North Lassiter, Odessa, Texas.

VALUATION and Reservoir Engineer: 15 years in present position with major oil company. Qualified to organize and direct reserve department making reserve estimates and valuations of oil and gas properties. Box E-885, The Oil and Gas Journal, Tulsa, Oklahoma.

MAN experienced in accounting methods in refining industry. Must have ability to set up and be in charge of accepted methods and procedures used in refining industry and be qualified to supervise office personnel. Box E-886, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PROCESS Engineer or Supervisor—Chemical Engineer, five years refining experience, including fluid catalytic cracking operation and supervision. Looking for responsible position with small refiner. Box E-889, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT desires part time work with oil operator, geological or petroleum engineering firm. Oil production accounting a specialty. Phone 7-9891 or 4-5828, Tulsa, Oklahoma.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column? Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

TRADE

WILL TRADE—390' of 13⅜" 61# new seamless casing, Fort Stockton, Texas, for light weight 13⅜" or 9⅝". Will Trade—Five miles of 4½" 10.79# line pipe at Ranger, Texas, for new 2" T&C line pipe. Deep Rock Oil Corporation, Joe A. Huitt, Tulsa, Okla.

FOR SALE — NATURAL GAS

FOR SALE: Natural gas open flow 15,000,000 cu. ft. Rock Pressure 679 pounds, well located 2½ miles east of Mounds, Okla. Could supply gas needs for a large factory in this area. Interested parties contact W. E. Griffith, 2-3052, Tulsa, Okla.

RANCHES and FARM LANDS

MOUNTAIN HOME $11,500. Bear Creek Canyon, 23 mi. from Denver. All furnished 4 bed R., Bath, Dining R., Large Liv. R. with Fireplace, Youngstown Kitchen, Basement, Garage, Oil Furnace, Hot water heater. By Owner. Photos on request. R. E. Byrnes, Kittredge, Colo.

NORTHERN LAKE HOME

Attractive 4 bedroom, 3½ baths. Beautifully furnished. 150 foot frontage on beautiful Lake Bemidji, Minnesota. 2-car garage. 2 servants rooms with baths. On paved road. Convenient to everything, but in heart of wild life area. Albert Clark, R.F.D. 5, Bemidji, Minn. Phone 536W.

GEOLOGISTS

INDEPENDENT exploration and research geologist desires retainers. Experienced in West Texas, New Mexico, Central Texas, North Texas, Oklahoma and surrounding areas. Located in Fort Worth. Box E-826, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Geologist planning independent career wishes to represent companies or individuals interested in Rocky Mountain region. Experienced in exploration and evaluation. Retainer basis. Box E-884, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

$50,000.00 WANTED for shallow production development with new recovery process, faster, cheaper than water, greater recovery, control patent technique, tremendous opportunity. Stoddard Oil Co., 134 E. 18th St., Minneapolis 3, Minn.

DO YOU HAVE SOMETHING YOU WANT SOLD?

Well established distributor to the oil and gas industry. Pipe lines, refining, gas distribution, etc. Desires additional items to sell. Excellent contacts, proven ability to produce.

Box E-850, The Oil and Gas Journal Tulsa, Oklahoma

ROYALTIES

WILLISTON BASIN ROYALTIES
Dealers in Montana royalties since 1921, we now specialize in royalties under major company leases in the Montana portion of the Williston Basin. For information on our method of operation, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

PRODUCTION
We Will Buy
PRODUCING landowners royalty and producing leases. Any amount, any area. Confidential information required and furnished. A 1 Bank Reference.
COMBEST ROYALTY COMPANY
825-826 Amarillo Bldg.
Amarillo, Texas

LEASE AND DRILLING BLOCKS

162 A. TEN YEAR oil lease, $1600. .50c rental, Carbon Co. Utah. Near Equity 8000' Ft. Penn-trst. nr Carbon-Dioxide gas well. R. Barnsley, 950 Lincoln Ave., Palo Alto, Calif.

OWN 460 acres Linn Co., Kansas, never been drilled. Could block good size lease gas & oil in area, want someone to drill. E. A. Tanquary, 1108 W. 77 Terrace, K. C. 5, Mo.

FOR LEASE: The owners of the land and/or the mineral rights on 75,000 acres in Northeastern Louisiana would like to secure proposals for exploration and development on large or small acreages. One producer on the tract. Box E-864, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

FOR SALE: 13,000 acres Wild Cat new 10 year leases, in SE New Mexico. Box E-865, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

NORTHWESTERN NORTH DAKOTA LEASES AND MINERALS
Our latest lists with prices, mailed on request. Will also buy acreage where you want it. Any place in Northwestern North Dakota. References exchanged.
BORSTAD & FITZMAURICE
Oil Properties
4th Floor 1st National Bank Bldg.
Phone 40-228 Minot, North Dakota

Central Area

(Continued from page 422)

White County: George & Wrather 1 Fobar-Long, NW SW NE 16-4s-10e, dry, TD 3,262 ft.

Stanford Oil Co. 1 Graves, NE SW SW 27-4s-10e, dry, TD 3,221 ft.

INDIANA SUCCESSFUL WILDCATS

Gibson County: Cherry & Kidd et al 1 Callard, NE SW SE 12-3s-13w, IP 14 bbl., Pennsylvanian-Mansfield sand 1,081-84 ft. and 1,093-94 ft., TD 1,243 ft. (discovery well Johnson South pool).

Posey County: Indiana Farm Bureau 1 Armbruster, SE NE SW 9-7s-13w, IP 40 bbl., Jackson sand 2,302-12 ft., TD 2,781 ft. (extends Mount Vernon South pool).

INDIANA WILDCAT FAILURES

Daviess County: I. F. McCandlish 1 Hays, NW NE NW 2-3n-7w, dry, TD 1,522 ft.

National Associated Petroleum Co. 1 Fleener, NE NE NE 3-3n-7w, dry, TD 1,138 ft.

Gibson County: National Associated Petroleum Co. 1 Davidson, Projection 25-1n-10w, dry, TD 1,860 ft.

Aurora Gasoline Co. 1 McEllhiney, NW SW SE 31-1s-9w, dry, TD 1,821 ft.

Ryan & Sharp 1 Victoria Davis, N½ NW SE 8-2s-12w, dry, TD 2,587 ft.

Knox County: Edler-Berger-Alvey 1 Richardson, Survey 4-4n-9w, dry, TD 3,005 ft.

George & Wrather 1 Robinson, Military Donation 172-2n-9w, dry, TD 1,629 ft.

Pike County: National Associated Petroleum Co. 1 Catt, SW SW SE 36-1n-8w, dry, TD 1,476 ft.

Posey County: Sanders & Fye 1-A Munford, SE NW SE 31-3s-13w, dry, TD 2,950 ft.

George S. Engle 1 Schuller, NE NW SE 3-7s-14w, dry, TD 2,966 ft.

Spencer County: Sun Oil Co. 1 Baumgartner, NE SE NE 16-6s-4w, dry, TD 1,022 ft.

Vigo County: T. & H. Corp. 1 Thompson, NE NE SE 30-11n-8w, dry, TD 1,912 ft.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Hopkins County: Lafitte Co. 3 Ashby, SW SE NE SW 14-L-26, IP 95 bbl., Cypress 2,358-67 ft., TD 2,367 ft. (opens new pay zone).

WESTERN KENTUCKY WILDCAT FAILURES

Daviess County: W. F. Lacy et al 1 J. S. Williams, WL SW NE NW 7-N-27, dry, TD 2,300 ft.

Henderson County: Skiles Oil Corp. 1 Raeber, NE NW SE SE 4-O-25, dry, TD 2,521 ft.

Ohio County: P. McBrayer 1 Reardon, W½ NW NW NW 15-O-33, dry, TD 775 ft.

MICHIGAN SUCCESSFUL WILDCAT

Allegan County, Trowbride Township: Ford Henry 1 VanNess, SW NW SE 23-1n-13w, Traverse 1,394 ft., 12 bbl. TD 1,398 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Heath Township: P. K. Degenther 1 Fuchs et al, NW NE SE 27-3n-14w, Traverse 1,436 ft., dry, TD 1,487 ft.

Macomb County, Macomb Township: Panhandle Eastern Pipe Line Co. 1 Crawford, C NW 28-3n-13e, Clinton 2,926 ft., dry, TD 2,941 ft.

Montcalm County, Pine Township: Rayner & Sigrist 1 Jorgensen, NE SW NE 8-11-8w, Dundee 3,312 ft., dry, TD 3,462 ft.

Newaygo County, Denver Township: Admiral Oil Corp. 1 Porter, NW NE SE 9-14n-14w, Traverse 2,188 ft., dry, TD 2,196 ft.

Van Burean County, Decatur Township: R. W. Yasdick, Trustee 1 Reeves, NE SE SE 13-4s-14w, Traverse 1,114 ft., dry, TD 1,116 ft.

Rocky Mountain Area

(Continued from page 423)

COLORADO WILDCAT FAILURES

Adams County: Roden, Darden & McRaie 1 Hayes, SE NE NE 12-2s-58w, dry, TD 5,855 ft. "J" sand 5,758 ft.

Logan County: Ginther-Warren & Ginther 1 Sherwin, NW NE NE 18-7n-51w, dry, TD 4,960 ft. Morrison 4,932 ft.

H. L. Hawkins 1 Mary Anderson, SW SW NW 22-8n-53w, dry, TD 5,148 ft. Dakota 4,856 ft.

Ginther-Warren & Ginther 1 Earl Bonham, SW NE NE 33-8n-55w, dry, TD 5,638 ft. "J" sand 5,474 ft.

WESTERN NEBRASKA SUCCESSFUL WILDCAT

Kimball County, Long area: Gene Goff 1 Long, SW SW NW 15-12n-55w, "D" sand discovery, new field, pumped 160 bbl. oil daily from "D" sand 6,090 ft., TD 6,285 ft. "J" sand 6,206 ft.

WESTERN NEBRASKA WILDCAT FAILURE

Kimball County: Vaughey 1 Bennett, SW SW SW 10-13n-54w, dry, TD 6,103 ft. "J" sand 6,036 ft.

UTAH WILDCAT FAILURE

Duchesne County, Juniper: Sinclair Oil & Gas Co. 1 Unit, NW SW NE 28-10s-17e, dry, TD 5,489 ft. Wasatch 4,489 ft.

NORTHERN NEW MEXICO WILDCAT FAILURE

San Juan County: Greenbrier Oil Co. 1 Foutz-Federal, NE SW NE 12-29n-15w, dry, TD 3,260 ft. Point Lookout 2,998 ft.

MONTANA WILDCAT FAILURE

Prairie County, Union area: The Texas Co. 1 Maciorski, C NW SW 23-16n-50e, dry, TD 10,762 ft. Ordovician 9,820 ft.

WYOMING WILDCAT FAILURES

Big Horn County: Foster Gulch: The Texas Co. 1 Unit, C NW SW 6-54n-96w, dry, TD 10,377 ft. Tensleep 10,309 ft.

Fremont County, Logan Gulch: Far West Oil Co. 1-A Government, C NW SW 34-33n-93w, dry, TD 4,627 ft. Tensleep 4,572 ft.

Natrona County, Teapot Dome: Bill Tomberlin 1 Government Genebach, SW SE SE 2-38n-78w, suspended, TD 1,152 ft.

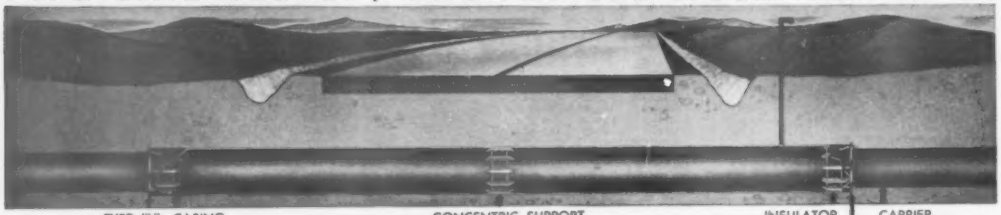
Niobrara County, East Mule Creek: Midwest Oil Co. and Yale Lewis 1 Avenall, SW NW NE 19-39n-60w, dry, TD 3,446 ft. Second Leo 3,403 ft.

Park County, Polecat area: Ajax Oil Co. 1 Vilander, SW NW NE 27-57n-98w, dry, TD 2,660 ft. Third Frontier 2,612 ft.

ADVERTISERS INDEX

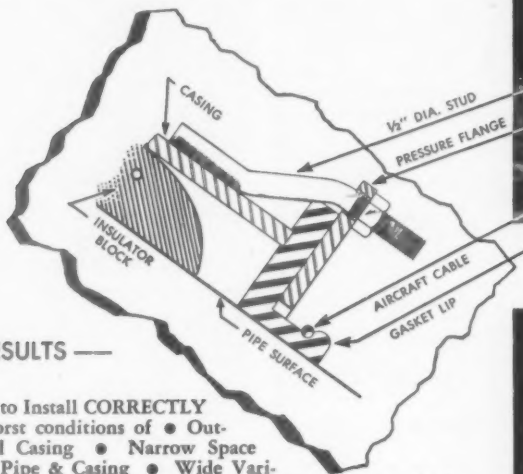
A-1 Bit & Tool Company 179
Acme Oil Tool Company 400
Acme Protection Equipment Co. 410
Aeroquip Corporation 159
Aerotec Corporation, The 25
Aetna Ball and Roller Bearing Company 138
Ainsworth & Sons, Inc., Wm. 410
Air Reduction Magnolia Company 119
Aldrich Pump Co., The 155
Algonquin Gas Transmission Company 392
Allis-Chalmers Mfg. Co. 67
Allis-Chalmers Mfg. Co. (Tractor Division) 136, 137
Alton Foundry & Machine Works 337
Aluminum Co. of America 18
American Air Filter Co., Inc. 148
American Bosch Corporation 31
American Cable Division of American Chain & Cable Co., Inc. Inside Back Cover
American Car and Foundry Company 160
American Cyanamid Company 176
American-LaFrance-Foamite Corp. 104
American Meter Company 253
American Optical Company 84
American Pipe & Steel Corp. 331
American Recording Chart Co. 368
Ampco Metal, Inc. 66, 69
Anchor Coupling Co., Inc. 117
Angio Iranian Oil Company, Limited 369
Anaul Chemical Co. 177, 415
Armstrong Bros. Tool Co. 392
Armstrong Machine Works 144, 145
Attapulgus Clay Company 111
Axelson Manufacturing Company 65, 148
Babcock & Wilcox Tube Company 356, 357
Baker Oil Tools, Inc. 186
Bank of Montreal, The 251
Baroid Sales Division, National Lead Company 290
Barrel, Inc., William M. 332
Barrett Division of Allied Chemical & Dye Corp. 281
Barton Instrument Corporation 298
Bell Rubber Company 400
Bethlehem Supply Co. 103
Black, Sivalls & Bryson, Inc. 9
Bonney Forge & Tool Works 57
Boston Woven Hose & Rubber Company 92
Bovaird Supply Co., The 72
Bowen Co. of Texas 147
Bristol Company, The 363
Brown Fintube Co., The 24
Bucyrus-Erie Co. 81
Budd Company, The 58
Buffalo Forge Company 374
Butler Manufacturing Co. 43
Byron Jackson Co. 10
Campbell Chain Company 47
Canadian Bank of Commerce 312
Cardwell Mfg. Co., Inc. 376, 377
Caterpillar Tractor Co. 6
Chain Belt Co. 83, 273
Chapman Valve Mfg. Co., The 172
Chase Brass & Copper Co. 48
Chevrolet Motor Div., General Motors Corp. 94
Chicago Bridge & Iron Company 223
Chicago Pneumatic Tool Company 166, 167
Christensen Diamond Products Co. 13
Chrysler Corp., Dodge Division 22
Chrysler Corporation, Industrial Engine Division 44
Cities Service Oil Co. 351
Clark Bros. Co. 361
Classified Advertising 431, 432, 433, 434
Cleveland Trencher Company, The 140
Continental Electric Co., Inc. 331
Continental Motors Corp. 79
Continental Supply Co., The 89, 90, 122, 134
Cooper-Bessemer Corp., The 234, 235
Cooper, Inc., Fred E. 283
C-O-Two Fire Equipment Company 277
Crose Manufacturing Co., Inc., M. J. 380
Cull-Hammer, Inc. 60
Darling Valve and Mfg. Co. 118
Davis Regulator Co. 343
Davison Chemical Corp., The 60, 61
Day Company, E. D. 382
Dean Brothers Pumps, Inc. 417
De Laval Steam Turbine Co. 164
Delta Engineering Sales Co. 397
Diamond Power Specialty Corp. 316
Dollinger Corporation 181
Dowell Incorporated 127
Drew & Co., Inc., E. F. 130
Drilling & Service, Inc. 423
Duff-Norton Mfg. Co., The 365
du Pont 73
Eagle-Picher Sales Co. 300
Eaton Manufacturing Company, Axle Div. 255
Edward Valves, Inc. 85
Elder & McNulty 390
Elliott Company 122
Empire Trust Company 417
Emsco Derrick & Equipment Co. 123, 124
Ensign Carburetor Company 96
Enterprise Engine & Machinery Co. 100
Equivalent Valve Company 398
Erie Bolt & Nut Co. 286
Ethyl Corporation 19, 20
Fairbanks, Morse & Co. 2
Farrel-Birmingham Co., Inc. 108
Farrel Engineering Corp. 91
Federated Metals Division American Smelting and Refining Company 383
First National Bank in Dallas 125
First National Bank in Houston 327
Fisher Research Lab., Inc. 396
Flexitallic Gasket Company 345
Floridin Company 326
Fluor Corporation, Ltd., The 389
Foster Company, L. B. 382
Four Wheel Drive Auto Co., The 158
Franks Mfg. Corp. Front Cover
Fuller Company 128
Gardner-Denver Company 59
Gaso Pump & Burner Mfg. Co. 134
Gates Rubber Co., The 8
General American Transportation Corp. 184
General Electric Company 182, 183, 294
General Tire & Rubber Co., The 101
Globe Company, The 327
Globe Oil Tools Company 399
Gold Foundry & Machine Works 398
Gordon Co., Claud S. 422
Goulds Pumps, Inc. 393
Grancell, I. H. 414
Graver Tank & Mfg. Co., Inc. 97
Great Lakes Corporation 52
Grinnell Company, Inc. 43
Griscom-Russell Co., The 366, 367
Grove Regulator Co. 66
Guiberson Corporation 410
H & M Pipe Bending Machine Co. 391
Haering & Co., Inc., D. W. 342
Halliburton Oil Well Cementing Co. 21
Harco Corporation, The 116
Harrisburg Steel Corporation 296
Hewitt Rubber Division, Hewitt-Robins, Incorporated 413
Hill, Hubbell and Company, Division of General Paint Corporation 131
Hinderliter Tool Co., Div. H. K. Porter Company, Inc. 188
Hough Co., The Frank G. 26
Houston Ready-Cut House Co., Inc. 419
Hudson Engineering Corporation 305, 308
Huey & Co., S. E. 382
Hughes Tool Co. Back Cover
Hyatt Bearings Division, General Motors Corp. 97
Hy-Test Safety Shoes, Division of International Shoe Company 79
Independent Exploration Co. 92
Inferno Co., The 398, 410
Ingersoll-Rand 141
Insley Manufacturing Corporation 382
International Harvester Co. 229
International Nickel Company, Inc., The 95
Iverson Supply Company 275
Jenkins Bros. 30
Jerguson Gage & Valve Co. 395
Johns-Manville Corporation 121
Johnson Plastic Corp. 324
Johnston & Jennings Co., The, Division of Pettibone Mulliken Corp. 321
Johnston Testers, Inc. 99
Jones & Laughlin Supply Co. 93
Jones Company, The S. M. 74
Joy Manufacturing Company 38
Kelley Company, Ben F. 358
Kellogg Co., The M. W. 106, 107
Ken Corporation 341
Kennametal, Inc. 287
Kenyon & Sons, Ltd., William 315
Kerr-McGee Oil Industries, Inc. 353
Kerrigan Iron Works, Inc. 295
Keystone Tool Co. 328
Kidde & Company, Inc., Walter 126
Kisley & Mueller, Inc. 45
Kinzbach Tool Co., Inc. 349
Klemp Metal Cutting Corporation 132
Koch Engineering Company, Inc., The 325
Koppers Company, Inc. 175
Landis Machine Co., The 11
Lane-Wells Company 4
Larkin Packer Company, Inc. 340
Layne & Bowler, Inc. 17
LeRoi Company 102, 103
LeTourneau, Inc., R. G. 76, 77
Lewington Shipbuilding Co. 330
Link-Belt Company 5
Louergan Co., J. E. 396
Lufkin Foundry & Machine Co. 80
Lummus Co., The 142
Lunkenheimer Co., The 63
Macwhyte Co. 3
Magnet Cove Barium Corp. 384
Mall Tool Company 359
Manhattan Rubber Division, Raybestos-Manhattan, Inc. 86
Manning, Maxwell & Moore, Inc. 58
Mantel 335
Marine Exploration Co. 181
Mark & Company, Clayton 382
Marley Company, Inc., The 7
Marlow Pumps 348
Marsh Instrument Co. 51
Mason-Neilan Regulator Co. 114, 115
McCord Corporation 338
McCullough Tool Company 356
McKee & Co., Arthur G. 139
McKissick Products Corporation 407
Mercoid Corp., The 319
Metal Goods Corporation 37
Mid-Continent Supply Company 50
Midwest Piping & Supply Co., Inc. 71
Minneapolis-Honeywell Regulator Co., Industrial Division 32, 33
Minneapolis-Moline 189
Moore Corporation, Lee C. 263
Morse Chain Company 148
Murdock Tank & Mfg. Co. 400
Nash Engineering Co. 62
National Airoil Burner Co., The 354
National Aluminate Corp. 224
National Bank of Tulsa 12
National Geophysical Company, Inc. 402
National Supply Co., The 53, 54, 55, 56
National Tube Company 29
Nelson Electric Mfg. Co. 318
Nelson Electric Supply Co. 419
Nicholson & Co., W. H. 177
Nordberg Mfg. Co. 421
Nordstrom Valve Division, Rockwell Manufacturing Company Inside Front Cover
Morris Brothers, Inc. 396
North American Car Corporation 189
Oakite Products, Inc. 383
Ohio Injector Company 14, 15
Oil & Gas Directory, Inc. 416
Oil Well Mfg. Corp. 345
Okadee Company 397
Orbit Valve Company 294
Pacific Gear & Tool Works 331
Pacific Pumps, Inc. 391
Pacific-Western Gear Products 331
Page Fence Association 311
Par-Ex Machine Co. 327
Paris Distributor, Inc., Henry H. 345
Parkersburg Rig & Reel Co. 319
Peerless Mfg. Co. 183
Penberthy Injector Co. 276
Perrault Brothers 398, 410
Petro-Chem Development Co., Inc. 179
Petroleum Electric Power Assn. 165
Philadelphia Gear Works, Inc. 340
Phillips Petroleum Company, Perco Division 394
Pioneer Rubber Co., The 398
Pioneer Rubber Mills 344
Pipeline Cleaners Co. 385
Pittsburgh Corning Corporation 129
Pittsburgh Steel Company 314
Plastic and Rubber Products Co. 353
Porocel Corporation 111
Powell Co., The Wm. 110
Procon, Incorporated 173
Pyrene Manufacturing Company 412
Quincy Compressor Co. 280
Rasmussen Mfg. Co. 398
Raybestos-Manhattan, Inc., Manhattan Rubber Division 86
Raybestos-Manhattan, Inc., Packing Div. 28
Raymond Concrete Pile Co. 36
Read Standard Corporation 409
Reed Roller Bit Company 370
Refinery Engineering Co., The 388
Reilly Tar & Chemical Corp. 364
Republic Flow Meters Co. 269
Republic Steel Corporation 153
Ridge Tool Company, The 299
Robbins & Myers, Inc. 348
Rockwell Manufacturing Company 75
Rockwood Sprinkler Company 133
Rolo Manufacturing Co. 311
Royal Bank of Canada, The 347
Rust-Oleum Corporation 23
S&R Tool & Supply Co. 305
Safway Steel Products, Inc. 423
Santa Fe System Lines 182
Sarco Company, Inc. 112
Schlumberger Well Surveying Corp. 157
Schutte and Koerting Company 138
Security Engineering Co., Inc. 248
Seismic Explorations, Inc. 382
Seismograph Service Corp. 232
SKF Industries, Inc. 350
South Texas National Bank 421
Southern Mill & Mfg. Co. 158
Southwestern Consultants, Inc. 393
Southwestern Industrial Electronics Co. 406
Spang & Co. 282
Sperry-Sun Well Surveying Co. 297
Standco Brake Lining Co. 400
Steel Forgings, Inc. 385
Sturtevant Co., P. A. 417
Superior Combustion Industries, Inc. 37
Tears Engineers 231
Thermix Corporation, The 25
Thermoid Company 348, 349
Thew Shovel Company 64
Thomas Flexible Coupling Co. 288
Thompson Tool Co. 282
Thornhill-Craver Co. 174
Timken Roller Bearing Company, Steel & Tube Division 149
Toledo Pipe Threading Machine Co. 132
Tracerlab, Inc. 418
Traction Company 113
Tretolite Company 143
Tulsa Winch Division of Vickers, Inc. 411
Twin Disc Clutch Co. 402
Union Wire Rope Corporation 408
Unit Rig & Equipment Co. 151
U. S. Steel Corp. Subsidiaries 39, 48, 49
United States Steel Company 48, 49
United Supply & Manufacturing Co. 278
Victaulic Co. of America 140
Victor Equipment Company 333
Vinson Supply Co. 139
Vogt Machine Co., Henry 150
Voss Co., Inc., J. H. H. 398
Walker Co., W. L. 397
Wallace & Tiernan Products, Inc. 383, 404
Warner Electric Brake & Clutch Company 170, 171
Water Cooling Equipment Company 397
Watson-Stillman 317
Waukesha Motor Company 34
Waukesha Sales & Service, Inc. 35
Well Equipment Mfg. Corp. 330
Western Company, The 267
Western Gear Works 331
Western Geophysical Company 401
Western Insulated Wire Co. 398
Western Pipe Line Constructors 388
Western Supply Company 338
Westinghouse Electric Corp. 40, 41
Wheatland Steel Products Company 18
Wheeling Machine Products Co. 391
Wickes Boiler Co., The 320
Wickwire Spencer Steel Division, Colorado Fuel and Iron Corp. 310
Williams & Co., J. H. 303
Williams Brothers 365
Williamson, Inc., T. D. 436
Wilson Foundry & Machine Co. 154
Wilson Manufacturing Co., Inc. 372
Winslow Engineering Co. 329
Wisconsin Motor Corporation 331
WKM Company 239
Worthington Corporation 82
Yarnall-Waring Company 70
Young Radiator Company 127

PIPE-LINE TESTED, PROVED and ACCEPTED in '51

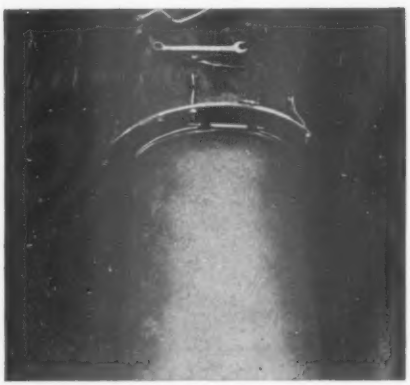


TYPE "L" WmSEAL CASING BUSHING*

A New Design: It BUTTS Against End of Casing Instead of Fitting Inside the Casing.



Assembling cable with rubber-covered union for clamping gasket lip to pipe.



THE COMPLETED INSTALLATION
Note that galvanized cable and union are insulated from pressure flange and from pipe.

RESULTS —

1. Easier to Install CORRECTLY under worst conditions of • Out-Of-Round Casing • Narrow Space Between Pipe & Casing • Wide Variations in Casing Wall and Coating Thickness • Mud • Casing ends beveled — by machine or hand torch.
2. WATER-TIGHT Seal with "L" gasket . . . . . .
   - BUTTED AGAINST CASING as pressure flange is tightened on ½" studs welded to casing.
   - TIGHT TO THE PIPE as aircraft cable (4,600# tensile) is tightened to gasket lip. Union is rubber covered to INSULATE galvanized cable assembly from bare casing structure.
3. Always Insulated from the pipe line when a Concentric-Support Insulator is installed just inside casing after the "drag section" is in place.

AS STRONG & DEPENDABLE AS THE MEN WHO INSTALL THEM

REPRESENTATIVES

Stuart Steel Protection Corp. Kenilworth N. J. | H. E. Davis Los Angeles 15, Calif. | James S. Kone Co. Amarillo, Texas | Keyes Tank Co. Provo, Utah | Keyes Tank & Supply Co. Casper, Wyoming | Canadian Equipment Sales & Service Co., Ltd. Edmonton, Calgary, Toronto, Canada

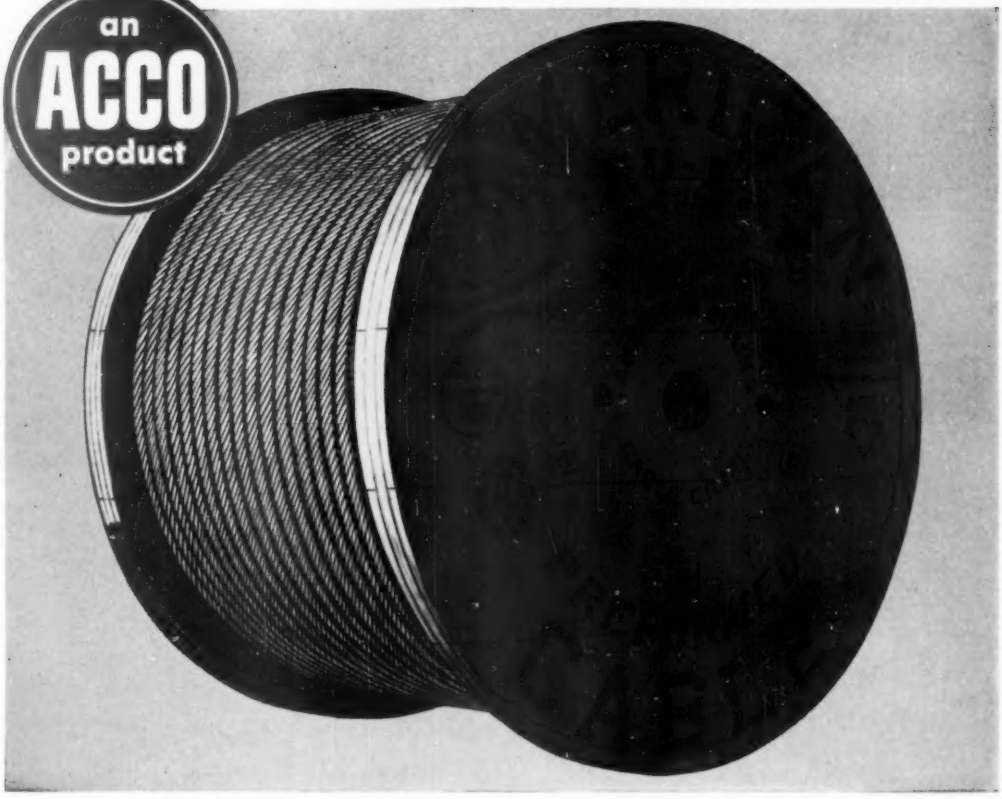
*Patent Pending

WRITE FOR BULLETIN 249A

T. D. Williamson, Inc.
TULSA 9, OKLAHOMA

8,000 Pipe Line Casings installed in 1951 with Williamson Bushings and Insulators

an **ACCO** product



The BEST Line for Rotary Drilling ...TRU-LAY Preformed

● For each use there is *one best* wire rope . . . one that will stand repeated loading, abrasion, crushing, or continuous bending, and be the best to buy.

To achieve this, there is a TRU-LAY Preformed Wire Rope made in 6x19 Seale, improved plow steel with steel core for your equipment. This construction has the exactly right combination of strength, bending life, and resistance to wear and crushing that you need.

The one best drilling line . . . TRU-LAY Preformed . . . will last you longer and cost less to use. Specify and get TRU-LAY Preformed.

Write for folder DH-209.

ACCO

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Makers of ACCO Registered WIRE ROPE SLINGS

This clean bottom hole pattern was cut in Pink Quartzite by a Hughes W7R hard rock bit.

HUGHES Tri-Cone®
ROCK BITS

• Designed for faster drilling

Every rock bit cuts a distinctive pattern as it rolls on bottom. These telltale imprints reveal the drilling characteristics of the bit.

That is why research, that brings the bottom of the hole to the surface—where the bit patterns can be studied and bit performance analyzed—plays such an important part in the development of Hughes Rock Bits.

Teams of research and product engineers test-drill every bit undergoing design changes. Blocks of rocks, representing specific formations, are used in these tests made under controlled conditions.

Armed with facts from these studies—and backed by 43 years experience in designing and manufacturing rock bits—Hughes engineers are able to design bits that are recognized the world over as the standard of the industry.